ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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

Website: www.ijircce.com

Vol. 8, Issue 3, March 2020

A Review: Study on Skin Cancer Detection Using Image Processing

Jagdish Prasad Bandhaw, Ekata Patil,

M. Tech Scholar, Digital Electronics, Department of ETC, CCEM Raipur, CSVTU, Bhilai, C. G., India

Assistant Professor, Department of ETC, CCEM Raipur, CSVTU, Bhilai, C. G., India

ABSTRACT: Now a day, Skin cancer is life threatening disease which causes human death. Abnormal growth of the melanocytic cells causes a skin cancer. Due to malignancy feature skin cancer is known as melanoma. Melanoma appears on skin due to exposure of ultraviolet radiation and genetic factors. So melanoma lesion appears as black and brown in color. Early detection of the melanoma can cure completely. Biopsy is a traditional method for detecting the skin cancer. This method is very painful and invasive. This method requires laboratory testing, so it may be time consuming. Therefore in order to solve above stated issues computer aided diagnosis for skin cancer is needed. Computer aided diagnosis uses dermoscopy for capturing skin image. In this paper first pre-processing of skin image is done. After pre-processing lesion part is segmented by using the image segmentation technique which is followed by feature extraction in which unique features are extracted from segmented lesion. After feature extraction, classification by using support vector machine is performed for classifying skin image as normal skin and melanoma skin cancer. The proposed system results give that support vector machine with linear kernel gives optimumaccuracy.

KEYWORDS: Melanoma Skin Cancer, Image Pre-processing, K-mean clustering, Feature Extraction.

I. INTRODUCTION

Now adays, cancer is one of wide spread cause of death. Uncontrolled growth of abnormal cells is called cancer. Human bodies consist of number of cells. Normal cells are produced by DNA. This normal cell again divided into other normal cell. Due to some problem defect can be occurs into DNA. This defected DNA produces abnormal cell. These abnormal cells again divided into other abnormal cells. This out of control growth of abnormal cells causes finally cancer. In Asian countries effect rate of cancer is far higher than otherscountries. There are more than 100 distinct types of cancer in which skin cancer is the most harmful disease. Skin cancer has an extensive number of patients now. Skin cancer causes due to rapid growth of abnormal skin cells, which causes skin tumors.

Melanoma skin cancer has been major cause of death now. Human body contains melanocytic cell. These cells present on skin. So, rapid growth of the abnormal melanocytic cells causes malignant melanoma. Due to malignancy feature skin cancer is known as melanoma. Melanoma usually develops in a mole or suddenly appears as a new dark spot on skin. Due to exposure of ultraviolet radiation from the sun and genetic defects is the main cause of skin cancer. So melanoma lesion appears as black and brown in color. The malignant melanomas are most dangerous form. Since it can easily affect the other parts of the body. Normally this malignant melanoma begins on skin surface where it is easy to see and treat. Then it grows deep in to skin and reaches at the blood vessels. Finally, it will spread to other parts of body and affect various organs.

Benign lesions will not spread by human body. Benign lesions and melanoma looks similar in the early stages. Benign lesions are like normal moles. They will not harmful to human skin. Benign lesion will differ from melanoma in Asymmetry, Border, Color and Diameter. Benign lesions are symmetric in the shape whereas Melanoma lesions are asymmetrical. Benign lesions are in circular shape but Melanoma has irregular shape. Benign lesion has uniform color whereas melanoma has variation in color. The diameter of benign the lesion is less than 6mm.
According to World Health Organization 132,000 melanoma skin cancer cases are diagnosed globally each year. In

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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

Website: www.ijircce.com

Vol. 8, Issue 3, March 2020

2012 melanoma occurred in 232,000 people and resulted in 55,000 deaths. The world's highest rates of the melanoma are found to be in Australia and New Zealand with incidence rate of 71 cases per 100,000 people, which is about four times the rate found in Canada, the United Kingdom and the United States. It is estimated that more than 8,500 people in theU.S. are diagnosed with skin cancer every day. American Cancer Society estimates that in 2016 about 76,380 new melanomas will be diagnosed (46,870 men, 29,510 women) and about 10,130 deaths from Melanoma (6,750 men, 3,380 women). The lifetime risk of getting melanoma is about 2.4% (1 in 40) for whites, 0.1% (1 in 1,000) for blacks and 0.5% (1 in 200) for Hispanics. So early detection of melanoma is very necessary.

Traditional method for detecting the skin cancer isbiopsy method. In biopsy method region of skin lesion is scrapped off and sent to laboratory for the testing. This method is invasive, painful and more time consuming. Therefore in order to overcome above stated problem, computer aided diagnosis used for skin cancer detection. This system requires skin image so there is no physical contact with body. This method will reduce pain and makes it non-invasive. Computer aided diagnosis uses image processing tools for the detecting Melanoma Skin Cancer. First step of such diagnosis is to preprocess skin image which is followed by image segmentation in which lesion part is segmented. Unique features are obtained from segmented lesion by feature extraction technique. After feature extraction, classification is performed for classifying skin image as ordinary skin and melanoma skin cancer.
Paper is organized as follows; Section 2 will give literature survey of the skin cancer detection. Section 3 provides proposed methodology of the skin cancer detection. Section 4 will give the implementation results and Section 5 concludes the paper.

II. LITERATURE SURVEY

Ramya et al. [1] proposed a technique to segment and identify the melanocytes in the skin epidermis area. The nuclei regions in the epidermis area are segmented using the K-means clustering algorithm with k value as 3. K-means clustering algorithm clusters the nuclei region based on space and color information. Then a local region recursive segmentation (LRRS) algorithm is applied to detect the candidate nuclei regions from the initially segmented image. LRRS uses two parameters: intensity and size of nuclei to filter out the candidate nuclei regions. Finally, a novel descriptor, named local double ellipse descriptor (LDED) is applied to differentiate melanocytes from keratinocytes. This proposed technique can provide good detection performance on histopathological images, where the background is complex and has similar appearance with the foreground.

Nikhil Cheerla et al. [2] proposed a novel system to segment the images without manual intervention. It uses a modified K-means algorithm for color segmentation and local binary pattern (LBP) changes for texture segmentation. From the segmented image, it extracts a set of features. The features were fed automatically to a multistage neural network classifier which achieved greater than 97% sensitivity and greater than 93% specificity. The trained system was tested with lesion images found online and it was able to achieve similar sensitivity. It achieves higher sensitivity and provides an easy to use iPhone based app to detect melanoma in early stages without the need for biopsy.

Ru-Song Meng et al.[3]This paper adopted the polarized-light dermoscopy image technology; acquired theimages of Melanocytic Tumor from the yellow race in a noninvasive way. This proposed the algorithms of adaptive clustering segmentation and feature extraction; analyzed the six features of Melanocytic Tumor images, including its asymmetry, eccentricity, border depressed rate, uniformity of radiation in transition area, color diversity and texture correlation; realized the classification and intellectualized recognition for benign or malignant. The sensitivity and the specificity of asymmetry and eccentricity were from 41.59%to 47.78% and from 69.91% to 76.99%.

Nidhalet al. [4] proposed a new segmentationmethod depending on histogram thresholding. The proposedalgorithm removes the effects of hair and othernoise by using Wiener filter. Proposed algorithm evaluated by comparing its segmented images withimages segmented by experts medical and measuring the distance between them by using twometrics (HM and TDR). Also the proposed algorithm compared with other technique and gives highly promisedresults. This approach can be used efficiently to support decision-making problems in skindiagnosis. The

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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

Website: www.ijircce.com

Vol. 8, Issue 3, March 2020

proposed methods are useful for segmentation of the pest in aided diagnostic computersystem to assist the clinical diagnosis of dermatologists. The accuracy of proposedmethod was 96.32%.

Nadia Smaoui et al.[5]. In this paper, the proposed work is based on a combination of a segmentation method and an analytical method. First a sequence of pre-processing is implemented to remove noise and unwanted structuresfrom the image. Then, an automatic segmentation approach locates theskin lesion. The use of region growing in our method based on automatic selection of the seed pixel and the threshold ensures the best results and avoids overlap between the lesion and healthy skin. The next step is feature extraction followed by the ABCDrule to classify pigmented skin lesion as benign or malignant through the calculation of the TDV score. Inthis paper, three diagnosis are used which are melanoma, suspiciousand benign skin lesion. The experiment uses 40 images containing suspicious melanoma skin cancer. The accuracy of the system is 92% with 4 false diagnosis of the 40 samples.

Cheng Luet al.[6] This paper proposed a computer-aided technique for segmentation of the melanocytes in the skin histopathological image. The candidate nuclei regions are firstextracted through the mean shift, and the proposed local regionrecursive segmentation (LRRS) algorithm. The local double ellipse descriptor (LDED) then incorporates the biological feature of melanocytesand provides robust parameters to identify the melanocytes. The evaluation using 30 histopathological images with differ different zooming factors shows that the proposed technique is ableto segment the melanocytes with over 80% sensitivity rate andover 70% positive prediction rate.

Rahil et al. [7] proposed an automatic segmentation algorithm based on color space study and clustering-based histogram thresholding which determines the color channel for detecting the borders in dermoscopy images. Each color channel undergoes preprocessing, clustering-based histogram thresholding and a set of pixel-based computations and morphological operators to identify the border of the lesion. Segmentation results are compared with automated results and manual borders independently drawn by four dermatologists. The comparison is made with four different metrics of accuracy, sensitivity, specificity and similarity, incorporating ROC analysis.

John Breneman et al. [8] Digital dermatoscopy techniques for diagnosing malignant melanoma are adapted to consumer-grade mobile devices with macro photography lenses and a prototype application for Android devices is presented. The preprocessor performs global image binarization via Otsu's method. For extracting lesion regions in digital images, including a difference-of-Gaussians (DoG) and support-vector machine (SVM) approach is used. A modified lens with a fixture to help a user position the mobile device at a precise standoff may also increase the accuracy of the results.

BinamrataBaralet al.[9] proposed a novel approach for segmentation based on Neuro-Fuzzy model using decision making. Segmentation is done with somefeature values of images. These features work as parameters. This approach by applying it on different dermatological images containing skin lesion which results in good quality segmentation of skin lesion .After applying proposed segmentation technique, it is
found that segmentation is achieved with good accuracy.

NimaFassihiet al. [10] proposed an algorithm to improve the diagnosesof melanoma by the use of image processing and machinevision. This algorithm consisted of preprocessing, image segmentation, feature extraction and classification. This paper employs coefficients of wavelet decomposition toextract image's features. Melanoma classification is carried outby using the variance and mean of wavelet coefficients ofimages as the inputs of neural network. Results show 90%ability in distinction between benign and malignant lesions.

Mahammedmessadi et al. [11] proposed an automated diagnosis system based on the ABCD rule used in clinical diagnosis in order to differentiate benign from malignant skin lesions. First, to reduce small structures, a preprocessing step based on morphological and fast marching schemes is used. Next, an unsupervised approach for lesion segmentation is proposed. Compare its accuracy with growcut and mean shift algorithms, and discuss how these results may influence in the following steps: the feature extraction and the final lesion classification. Four features: asymmetry (a), border (b), color (c) and diversity (d) are computed and used to construct a classification module based on artificial

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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

Website: www.ijircce.com

Vol. 8, Issue 3, March 2020

neural network. A large dataset of 320 dermoscopy images shows that the proposed technique is able to provide more accurate segmentation results than methods like Grow Cut algorithm and Mean shift approach.

Khaled Abu et al. [12] proposed an automatic skin cancer (melanoma) classification system. To the set of input images for benign and malignant skin lesions, two segmentation methods are used to recognize the skin lesions before extracting the valuable feature information from these images. For training and testing these information is passed to the classifier. Features used for classification are Wavelet decompositions or simple wrapper Curve lets.

CatarinaBarataet al. [13]. This paper addresses two differentsystems for the detection of melanomas indermoscopyimages. The first system uses global methods to classify skinlesions, whereas the second system uses local features and thebag-of-features classifier. The other objective is tocompare the role of color and texture features in lesion classificationand determine which set of features is more discriminative.It is concluded that color features outperform texture featureswhen used alone and that both methods achieve very good results i.e., Sensitivity = 96% and Specificity = 80% for globalmethods against Sensitivity = 100% and Specificity = 75% forlocal methods. The classification results were obtained on a dataset of 176 dermoscopy images.

Narmadha et al.[14]. This paper proposed Computer aided system use different technique to reduce the pain and time of cancer affected patient. Thus it separates the affected Melanocyte in the epidermis area. The cancerimage is given as input to the system. As the image contains dust (noise & hair) it should be removed first. The candidate nuclei regions are first extracted through the Level Set segmentation algorithm and the proposed local region recursive segmentation algorithm.SVM (Support VectorMachine) is proposed. Thus the proposed systemproduces accurate result with over 80% sensitivity rate and over 70% positiveprediction rate.

RahilGarnavi et al. [15]. Proposed a fresh computeraided diagnosis system for melanoma. Selection of features prepared by using the gain-ratio method. Classification is complete throughout by four classifiers; support vector machine, randomforest, logistic model tree, and hidden naive Bayes. This is applied

III. PROPOSED SYSTEM

It is observed that lots of work found in literature is based on image processing techniques. It involves image preprocessing, image segmentation, feature extraction & classification as given in earlier version of this paper. Proposed method contains two subsections: A] System overview and B] System flow diagram. System overview gives the pictorial overview of system where system flow diagram gives the flow of proposed system.

System Overview

Pictorial overview of skin cancer detection is shown in Figure 1. In below figure 1st image is skin cancer image. This skin image contains some hairs and air bubbles which will reduce classification accuracy. So that hair removal is done in the next step. After hair removal image segmentation is performed in which lesion part is segmented from image. After segmentation unique features are obtained using feature extraction which is followed by the classification. All these steps are in Figure 1.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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

Website: www.ijircce.com

Vol. 8, Issue 3, March 2020

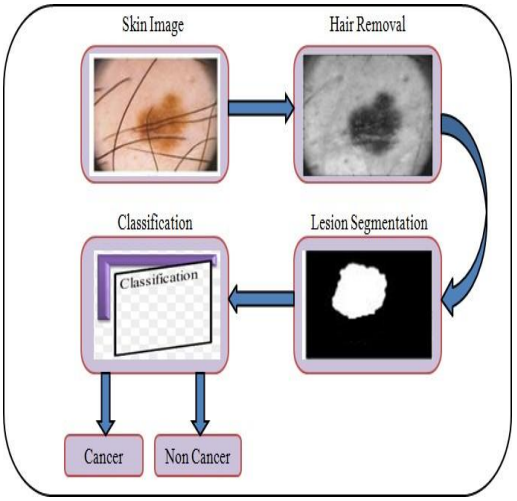

Figure 1: Skin Cancer Detection Overview

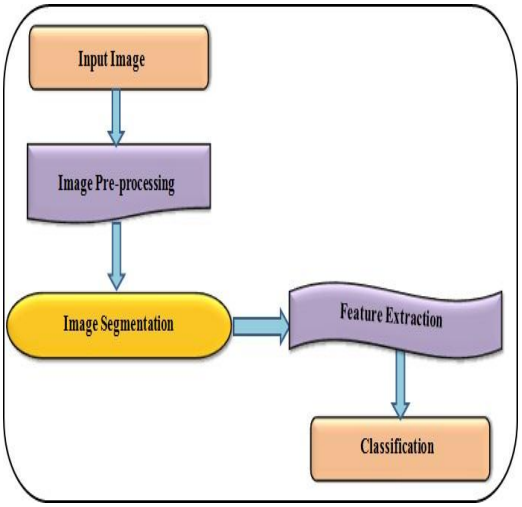

Figure 2: System Flow Diagram

System FlowDiagram

Computer based detection of the skin cancer contains four steps: image pre-processing, image segmentation, feature extraction and classification. Melanoma affected skin imageisgiven asi/p to system. This image is pre-processed for the improving the quality of image. After pre-processing lesion part is segmented from skin by using image segmentation techniques. Image segmentation is followed by feature extraction which extracts unique features. After feature extraction, classification is performed for classifying image as benign lesion and melanoma skin cancer. System flow diagram is in below Figure2.

Image Pre-processing

Pre-processing is initial step in image processing which is shown in Figure 2.Input to system is skin image. This image contains some background noise and unwanted things such as hair &air bubbles. Such objects reduce result of segmentation and classification. In this system input image is converted into a gray color. For removing hairs Gaussian filter was used.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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

Website: www.ijircce.com

Vol. 8, Issue 3, March 2020

Feature Extraction

Feature extraction is the method of calculating unique features from the image. These features will represent properties of input image. This step is important. Melanoma skin image have color variation where benign lesion have uniform skin color. Another difference is benign lesion have circular shape and melanoma have irregular shape. So in this system color, perimeter, area, irregularity and texture feature will be extracted from the skin image.

Classification

Classification of data is one of most frequent decision making tasks performed by human. In this step classifier classifies melanoma lesion from benign lesion. So selection of classifier is an important step. Performing classification of melanoma from benign lesion SVM classifier is used here. In machine learning, support vector machines are supervised learning models that are widely used for classification. Concept of SVM is based on the hyperplane that defines decision boundaries. SVM hyperplane separates objects which will distinguish classes. SVM has different kernel function from which linear function and radial basis function is used for classify data into malignant or benign.

IV. CONCLUSION

This paper represents efficient method for the skin cancer detection. This system uses computer aided diagnosis for the skin cancer detection. Manually detecting skin cancer is not only tedious but also very time consuming task. Traditional method for detecting skin cancer is a biopsy. In this method portion of suspicious lesion is scrapped off and sent to laboratory for testing. So this method is invasive, painful, and very time consuming. Therefore in order to solve the above stated issues computer aided diagnosis is needed here. In this system skin image is preprocessed then segmentation is performed using a segmentation technique which is followed by the feature extraction. Classification is performed on the extracted features. SVM classifier is applied for cancer classification. It is observed that SVM linear function perform better than the radial basis function and bayesnet classifier. SVM linear function gives highest accuracy for classification of melanoma from benign lesion. This system requires only skin image for detecting cancer so there is no physical contact with any part of the body. Due to image this system makes non-invasive skin cancer detection. There is no need of laboratory for testing. So this system is very less time consuming. This system is less costly because only camera is needed for taking skin image, so this system efficiently and effectively used.

REFERENCES

[1] P. Ramya, “Skin Histopathological Image Used LDED Based Algorithm withAutomated Detect ion of Melanocytes Skin”, Middle-East Journal of Scientific Research 20 (8): 986-991, 2014.
[2] Nikhil Cheerla and Debbie Frazier, “Automatic Melanoma Detect ion Using Multi-Stage Neural Networks”, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 3, Issue 2, February 2014.
[3] Ru-Song Meng1, Xiao Meng2, Feng-Ying Xie3, Zhi-Guo Jiang, “ Early diagnosis for cutaneous malignant melanoma based on the intellectualized classification and recognition for images of melanocytic tumor by dermoscopy”, Journal of Biomedical Graphics and Computing, Vol. 2, No. 2, December 2012.
[4] NidhalKhdhair El Abbadi and Abbas Hussien Miry, “AUT OMAT IC SEGMENTATION OF SKIN LESIONS USING HISTOGRAM T HRESHOLDING”, Science Publications, Journal of Computer Science 10 (4): 632-639, ISSN: 1549-3636, 2014
[5] Nadia Smaoui and SouhirBessassi, “A developed system for melanoma diagnosis”, International Journal of Computer Vision and Signal Processing, 3(1), 10-17(2013).
[6] Cheng Lu, Muhammad Mahmood, NareshJha, MrinalMandal, “Automated Segmentation of the Melanocytes in Skin Histopathological Images”, IEEE JOURNAL OF BIOMEDICAL AND HEALTH INFORMATICS, VOL. 17, NO.2, MARCH 2013.
[7] R.Garnavi,M.Aldeen, M. E. Celebi, A Bhuiyan, C.Dolianit is, and G. Varigos, “ Automatic segmentation of dermoscopy images usinghistogram thresholding on optimal color channels”, World Academy of Science, Engineering and Technology , International Science Index Vol:5, No:7, waset .org/Publication/307907-26, 2011.
[8] John Breneman, “Towards Early-Stage Malignant Melanoma Detect ion Using Consumer Mobile Devices”, 2012.
[9] BinamrataBaral, SandeepGonnade, ToranVerma , “ Lesion Segmentation in Dermoscopic Images Using Decision Based Neuro Fuzzy Model”, BinamrataBaral et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (2) , 2014, 2546-2552.
[10] NimaFassihi, JamshidShanbehzadeh, AbdolhosseinSarafzadeh, ElhamGhasemi, “Melanoma Diagnosis by the Use of Wavelet Analysis based on Morphological Operators”, Proceedings of the International Multi-conference of Engineers and Computer scientists 2011 Vol I, IMECS 2011, March 16-18, Hong Kong.
[11]Mahammed MESSADI, 2Hocine CHERIFI and 1Abdelhafid BESSAID, “Segmentation and ABCD rule extract ion for skin tumors classification”, Journal of Convergence Information Technology(JCIT)Volume9, Number2, March 2014.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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

Website: www.ijircce.com

Vol. 8, Issue 3, March 2020

[12] Md. Khaled Abu Mahmoud, Adel Al-Jumaily, MaenTakruri, "Wavelet and Curve let Analysis for Automatic Identification of Melanoma Based on Neural Network Classification", International Journal of Computer Information Systems and Industrial Management (IJCISIM). ISSN 2150-7988 Volume 5 pp. 606-614. 2013.
[13] CatarinaBarata, Margarida Ruela, Mariana Francisco, Teresa Mendonça, and Jorge S. Marques, " Two Systems for the Detect ion of Melanomas in Dermoscopy Images Using Texture and Color Features ", IEEE SYST EMSJOURNAL, May 10, 2013.
[14] Narmadha.R, PG scholar 2nd AhalyaMary.J, "Alienat ion of Melanocytes in Cancer Pretentious Cells using Level Set Segmentation Algorithm", International Journal of Computer Science and Mobile Computing, Vol.3 Issue.4, April- 2014, pg. 239-249.
[15] RahilGarnavi, Mohammad Aldeen, and James Bailey, "Computer-Aided Diagnosis of Melanoma Using Border- and Wavelet -Based Texture Analysis", IEEE TRANSACT IONS ON INFORMATION T ECHNOLOGYIN BIOMEDICINE, VOL. 16, NO. 6, NOVEMBER 2012.