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Melanoma Skin Cancer Detection using Image Processing

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Abstract

Among the three basic types of skin cancer, viz, Basal Cell Carcinoma (BCC), Squamous Cell Carcinoma (SCC) and Melanoma, Melanoma is the most dangerous in which survival rate is very low. The proposed skin cancer detection technology is broadly divided into four basic components, viz., image preprocessing which includes hair removal, de-noise, sharpening, resize of the given skin image, segmentation which is used for segmenting out the region of interest from the given image. Here we have used Otsu thresholding method. The classification algorithm which are going to be used here are Support Vector Machine(SVM).

Keywords— *Melanoma skin cancer, Image segmentation, K-mean, GLCM, Support Vector Machine (SVM).*

I. INTRODUCTION

Out of three types of skin cancer, viz., Squamous Cell Carcinoma (SCC), Melanoma and Basal Cell Carcinoma (BCC), Melanoma is very dangerous in which survival rate is low. Early detection of Melanoma can improve survival rate of patient. In USA, every hour one person dies due to melanoma. From a study, approximately 87,110 cases of melanoma was diagnosed in 2018. Among them, 9,730 were died because of melanoma. Melanoma consists of only 1% of all skin cancer cases but the reason for majority of skin cancer death. Most of melanomas are caused by the sun. From a survey done by a UK University, it is found that 86% of melanomas are exposed by ultraviolet (UV) radiation. On an average, people's risk for melanoma doubles if he or she has had more than 5 sunburns. If a person use SPF 15 or higher SPF sunscreen regularly it can reduce the risk of melanoma by 50% and SCC by 40%. [1]

II. EARLIER WORK

This is the scenario for which many projects have been tried and developed. Although not same but many related work have been done by many researchers. Some of papers have been referred and explored here. A detailed analysis of the existing systems is done. This study helped in identifying the benefits and also the drawbacks of existing systems.

[1] Enakshi Jana, Dr. Ravi Subban, S.Sarawathi, "Research on skin cancer cell detection using image processing", 2017. In this paper, an extensive literature survey of current technology is made for skin cancer detection. Of all the methods used for skin cancer detection, SVM and Adaboost produces the best results. [2] Shivangi Jain, Vandana Jagtap, Nitin Pise, "Computer aided melanoma skin cancer detection using Image processing", 2015. In this paper it is concluded that the proposed system can be effectively used by patients and physicians to diagnose the skin cancer more accurately. This tool is more useful for the rural areas where the experts in the medical field may not be available. [3] Vijayalkshmi M.M, "Melanoma skin cancer detection using Image processing and machine learning", June 2019. The aim of this project is to determine the accurate prediction of skin cancer and also to classify the skin cancer as malignant or non-malignant melanoma. [4] Sanjana M, Dr. V. Hanuman Kumar, "Skin cancer detection using Machine learning algorithm", Dec 2018. This paper focuses on determining the stage of the skin cancer, based on various feature such as the area of the spread, diameter, color of the lesion, etc. The analysis can be made with the help of machine learning

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algorithm.[5] Jianpeng Qi, Yanwei Yu*, Lihong Wang, and Jinglei Liu School of Computer and Control Engineering, Yantai University, Yantai, Shandong 264005, China, "K*-Means: An Effective and Efficient K-means Clustering Algorithm", in 2016 IEEE International Conferences on Big Data and Cloud Computing (BD Cloud), Social Computing and Networking (Social Com), Sustainable Computing and Communications (Sustain Com). [6] Ginu George, 2 Rinoy Mathew Oommen, 3 Shani Shelly, 4 Stephie Sara Philipose, 5 Ann Mary Varghese 1,2,3 UG Scholar, Department of Computer Science and Engineering, "A Survey on Various Median Filtering Techniques For Removal of Impulse Noise From Digital Image", IEEE Conference on Emerging Devices and Smart Systems (ICEDSS 2018) 2-3 March 2018.

III. **PROPOSEDMETHODOLOGY**

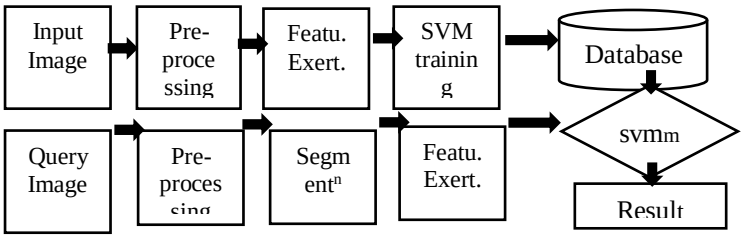

Fig 1 Block Diagram

The system has two parts, training and testing. Both parts undergo following steps:

1. Image Acquisition

In this section we are going to discuss about the available datasheet of the skin-image. For training our model we are going to use two types of skin-images: i) dermoscopy image ii) digital image. The dermoscopy image are captured by dermatoscope. The digital images are captured by any picture capturing devices like our mobile phone. The image captured by dermatoscope have high focus on region on interest, whereas with the digital image the focus on region on interest is less. We have collected 5026 Dermoscopy Image from https://www.isic-archive.com/(The International Skin Imaging Collaboration)

2. Image Preprocessing

In the second step we are doing image preprocessing. The processes involved in the preprocessing are like hair removal, noise removal, enhancement, color conversion. In hair removal algorithm, we have used opening and closing algorithm.
For noise removal we have used median filter. For enhancement purpose we have used histogram. For training our model we needed all the images of same dimensions, for this purpose we resized the images.

A. Median filter

The skin-images collected from different sources contains different types of noise. This type of images is not suitable for further processes. So it is necessary to remove noise from the images. Here we are using Median filter for noise Removal. The Median Filter is very popular method for removing noise from the images. It is a non-linear digital filtering method. It is widely used method because under certain condition, it does not effect the edges of the images while filtering.

B. Opening and closing

The image collected of the skin may contain hair , so it is necessary to remove the hair from the skin-

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images. Hence for removing the hair from skin-images we are using opening and closing algorithm.
Opening removes small objects from the foreground of the skin-image, placing them in the background, whereas closing removes small holes in the foreground, which changes small islands of background into foreground.

C. Histogram equalization

After filtering the skin-images, the quality of the images is reduced. So for the contrast enhancement of the images we are using Histogram Equalization.
Histogram Equalization is an image processing technique which is used to improve contrast of an images.

D. Image resize

The image collected after different preprocessing method will be of different sizes. So we need all the images should of same size for further process. Here we are resizing all the images into 1022x767.

3. Image Segmentation

Next step is image segmentation. Image segmentation is very important step while working on image processing. The skin-images on which we are going to work contains the cancerous mole along with the skin part, so it is very important to remove the region of interest. So for this purpose we are going to use Otsu segmentation method. The output is shown in Fig.4

4. Feature Extreaction

For working of any machine learning algorithm we need predefined features. Our proposed method is GLCM.
To create a GLCM, the gray co-matrix function is used. The gray-level co-occurrence matrix (GLCM) is created by gray co matrix function. This is done by determining how often a pixel with the intensity (gray-level) value i occurs in a specific spatial relationship to a pixel with the value j. Each element (i, j) in GLCM is found by the sum of the number of times that the pixel with value i occurred in the specified spatial relationship to a pixel with value j in the input image. Because the processing is required to calculate a GLCM for the full dynamic range of an image is prohibitive, gray co-matrix scales the input image. The scaling is used by gray co-matrix for reducing the number of intensity values in grayscale image from 256 to eight. The size of the GLCM is determined by the number of gray levels. The number of gray levels the matric called GLCM and intensity value scaling can be controlled by the NumLevels and the Gray Limits parameters. Certain properties of the spatial distribution of the gray scale image can be revealed by gray-level co-occurrence matrix. For instance, when most of the values in the GLCM are clustered along the diagonal, the texture is coarse with respect to the specified offset. Several statistical measures can be derived from the GLCM. Segmentation is followed by feature extraction. No machine learning algorithm can work without predefined features set. The type of features can be broadly divided into following categories.

5. Designing The Model

For making the skin cancer detection model, there are three proposed method: (1) Artificial Neural Network. (2) Support Vector machine (SVM). (3) Deep Neural Network. The data that is collected by features extraction algorithm which is followed by image preprocessing is used for classification of cancerous or non-cancerous images.

A. SVM

Support vector machine is supervised machine learning algorithm. In supervised learning algorithm

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we uses labeled data to train our model. SVM is mainly used to classify the data into two classes. SVM makes use of Hyperplane for segmenting the data into different cluster.

One of the advantages of using SVM is that, it can be used for both classification and regression problem. It can be also used for classification of Non-Linear data by using Kernel.

In our project we are going to classify the images into Melanoma or Non-Melanoma. This is going to be done by Training the model using the data collected from the features extraction technique. The SVM draws a hyper plain which segments the data into two cluster. It is shown in Fig.1

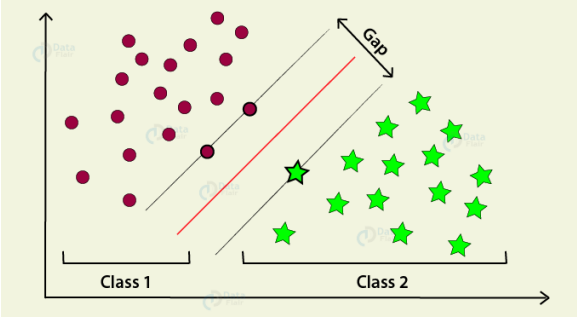

Fig. 1

The Classification accuracy of SVM is very high using small data set as compare to CNN and ANN.

IV. EXPERIMENTATION & RESULT

Now a days a lots of research have been made on cancer but detection of cancer is even a challenging task due to lack of accurate model. The detection is not a uni-disciplinary but a multi-disciplinary equations.

The proposed system makes use of MATLAB 0.9 R208a software for processing of the Dermoscopic images. MATLAB provides a lots of library for performing mathematical calculation like linear algebra, statistics, Fourier analysis, filtering, optimization, numerical integration and solving ordinary differential equations.

The dermoscopic images needs to pass through various steps for making it suitable for training the Model. Opening and closing are performed for hair removal. The results of opening and closing are shown in fig. 3

Fig. 2 Original Image

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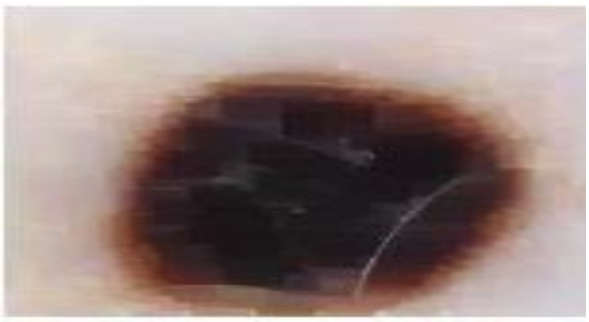

Fig. 3 Image After performing opening and closing

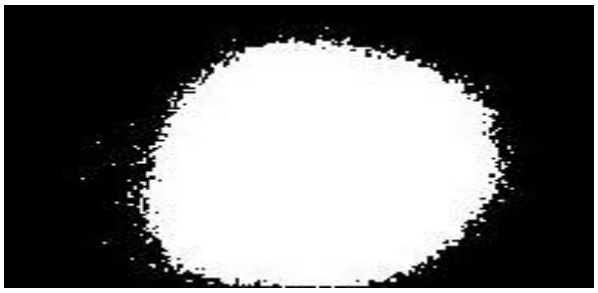

Fig. 4 Image after Otsu segmentation.

V. CONCLUSION

The proposed system of skin cancer detection can be implemented using support vector machine to classify easily whether image is cancerous or non-cancerous. The system will determine the stage of the skin cancer, based on various features such as the area of the spread, diameter, color of the lesion, etc. The analysis can be made with the help of the machine learning algorithm, in which we train the system based on the history of the images stored in the database, and the test image comes in the category of the melanoma or not, if it does, then to determine its stage. A comparison can be made with the existing systems, machine learning reduces the computational time. Hence, the treatment can begin faster.

REFERENCES

1. Enakshi Jana, Dr. Ravi Subban, S.Sarawathi, “Research on skin cancer cell detection using image processing”, 2017.
2. Shivangi Jain, Vandana Jagtap, Nitin Pise, “Computer aided melanoma skin cancer detection using Image processing”, 2015.
3. Vijayalkshmi M.M, “Melanoma skin cancer detection using Image processing and machine learning”, June 2019.
4. Sanjana M, Dr. V. Hanuman Kumar, “Skin cancer detection using Machine learning algorithm”, Dec 2018.
5. Jianpeng Qi, Yanwei Yu*, Lihong Wang,and Jinglei Liu School of Computer and Control Engineering, Yantai University, Yantai, Shandong 264005, China, “K*-Means: An Effective and Efficient K-means Clustering Algorithm”, in 2016 IEEE International Conferences on Big Data and Cloud Computing (BDC loud), Social Computing and Networking (SocialCom), Sustainable Computing and Communications (SustainCom).
6. Ginu George, 2 Rinoy Mathew Oommen, 3 Shani Shelly, 4 Stephie Sara Philipose, 5 Ann Mary Varghese 1,2,3 UG Scholar, Department of Computer Science and Engineering, “A Survey on

ISSN: 2233-7857 IJFGCN

Various Median Filtering Techniques For Removal of Impulse Noise From Digital Image", IEEE Conference on Emerging Devices and Smart Systems (ICEDSS 2018) 2-3 March 2018.
7. Pratik Dubal, Sankirtan Bhat, Chaitanya Joglekar, Dr. Sonal Patil, "Skin cancer detection and classification", 2017.
8. Mohd Afizi Mohd Shukran, Nor Suraya Mariam Ahmad, Farahana Rahmat, "Melanoma cancer diagnosis device using Image processing techniques", Feb 2019.
9. Nay Chi Lynn, Zin Mar Kyu, "Segmentation and classification of skin cancer melanoma from skin lesion images", 2017.
10. Soniya mane, Swati Shinde, "Method for Melanoma Skin Cancer Detection Using Dermoscopy Images", 2018. [11] Vedanti Chintawar, Jignyasa Sanghavi, "Improving Feature Selection Capabilities in Skin Disease Detection System", June 2019.
11. R.S. Shiyam Sundar,M. Vadivel, "Performance Analysis of Melanoma Early Detection using Skin Lession Classification System", 2016.
12. Andy Chiem, Adel Al-Jumaily, Rami N. Khushaba, "A Novel Hybrid System for Skin Lesion Detection", 2007.
13. Ramandeep Kaur, Gagandeep, Parveen Kumar, Geetanjali Babbar, "An Enhanced and Automatic Skin Cancer Detection using K-Mean and PSO Technique", July 2019.
14. Wilson F. Cueva, F. Muñoz, G. Vásquez., G. Delgado, "Detection of skin cancer "Melanoma" throughComputer Vision", 2017.
15. Ilias Maglogiannis, Elias Zafiropoulos, Christos Kyranoudis, "Intelligent Segmentation and Classification of Pigmented Skin Lesions in Dermatological Images", 2006. [17] Maram W. Rashad, Maen Takruri, "Automatic Non-Invasive Recognition of Melanoma Using Support Vector Machines", 2018.
16. Cancer Facts and Statistics. http://www.skincancer.org/ skin-cancer-information/skin-cancer-facts.
17. https://medium.com/machine-learning-101/chapter-2-svm-support-vector-machine theory-f0812effc72
18. https://towardsdatascience.com/https-medium-com-pupalerushikesh-svm-f4b42800e989
19. https://melanoma.canceraustralia.gov.au/statistics

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