DISCOVERY OF MELANOMA CARCINOMA USING IMAGE PROCESSING APPROACH

G.Prathima
Research Scholar
Department of computer Science
Dr.M.G.R Educational and Research Institution, Chennai
Dr.R.Shoba Rani
Associate Professor
Department of computer Science& Information Technology
Dr.M.G.R Educational and Research Institution, Chennai

ABSTRACT

Basal cell carcinoma develops in the cells within the epidermis the highest or outer layer of the skin. Exposure to UV radiation is the main reason that causes skin cells to become cancer cells. Melanoma carcinoma are curable at early stages. To overcome the stated issues different techniques used for basal cell carcinoma detection. These techniques works on image so there's no physical contact with skin, so this is often non-invasive. These techniques use Image Processing tools for the detection of Melanoma carcinoma. These techniques first pre-process the skin image that suppresses unwanted distortion or enhances some image features important for further processing which is followed by image segmentation. Feature extraction is performed on segmented lesion. The extracted features can be used to classify the image as normal skin and of basal cell carcinoma.

INTRODUCTION

Melanoma is a cancer that begins in the melanocytes.Globally in 2012, it newly occurred in 232,000 people. In 2015 there were 3.1 million with active disease which resulted in 59,800 deaths. Australia has the highest rate of skin cancer in the world. Two in 3 Australians will develop some form of skin cancer before the age of 70. Over 750000 Australians are treated for skin cancer every year and although skin cancer is more likely to occur in people who are older, Melanoma is much less common than some other types of skin cancer. But melanoma is more dangerous because it’s much more likely to spread to other parts of the body. It is important to remember that melanoma the most serious form of skin cancer is a common cancer in young people. Most skin cancer can be cured if they are diagnosed and treated early.

LITERATURE REVIEW

In this section the works carried out by various researchers are as follows

1. Skin Cancer Detection Using Digital Image Processing

In this paper a computer aided method for the detection of Melanoma Skin Cancer using Image processing tools. The Lesion Image analysis tools checks for the various Melanoma parameters Like Asymmetry, Border, Colour, Diameter, (ABCD) etc. by texture, size and shape analysis for image segmentation and feature stages. The extracted feature parameters are used to classify the image as Normal skin and Melanoma cancer lesion.

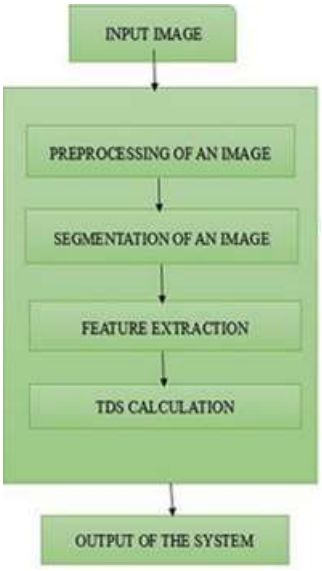

Figure 1Skin Cancer Detection Using Digital Image Processing.

a) ImagePre-processing

This process is applied in order to make sure that all the images are consistent in desired characteristic. Pre-processing can cover number of features like: image illumination equalization, color range normalization, image scale fitting, or image resolution normalization.

b) Segmentation Techniques

i)Threshold Based Segmentation

Histogram thresholding and slicing techniques are used to segment the image. They may be applied directly to an image, but can also be combined with pre- and post-processing techniques.

ii)Clustering Techniques

Clustering is sometimes used as a synonym for (agglomerative) segmentation techniques, in the context, clustering methods attempt to group together patterns that are similar in some sense. Some clustering techniques can readily be applied for image segmentation.

iii)Edge Detection Based

When they know what an object they wish to identify in an image (approximately) looks like, they can use this knowledge to locate the object in an image. That approach to segmentation is called matching.

c)Feature Extraction

As per ABCD rule the features which are extracted Asymmetry Index Border Color Index Diameter.

TDS Calculation

Following formula is used

TDS = 1.3A + 0.1B + 0.5C + 0.5D

If the TDS Index is less than 4.75, it is benign (noncancerous) skin lesion. If TDS Index is greater than 4.75 and less than 5.45, it is suspicious case of skin lesion. If TDS Index is greater than 5.45, it is malignant melanoma (cancerous) skin lesion.

2. Skin Cancer Detection Using Image Processing

Skin cancer detection is implemented by using GLCM and Support Vector Machine (SVM). Gravy Level Co-occurrence Matrix (GLCM) is used to extract features from an image that can be used for classification. SVM is machine learning technique, mainly used for classification and regression analysis.

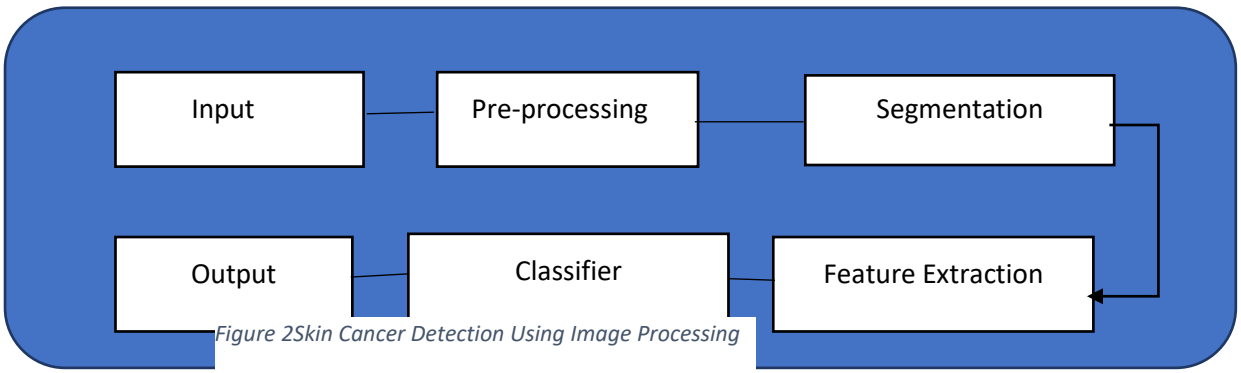

Figure 2Skin Cancer Detection Using Image Processing

a) Pre-processing

Image pre-processing involves three main things 1) Gray scale conversion 2) Noise removal 3) Image enhancement.

b) Segmentation

Segmentation is process of removing region of interest from given image. Region of interest containing each pixel similar attributes. Here we are using maximum entropy thresholding for segmentation

c) Feature Extraction

Feature extraction plays an important role in extracting information present in given image. Here we are using GLCM for texture image analysis. GLCM is used to capture spatial dependency between image pixels.

d) Classifier

Support Vector machine classifier is used here. Svm takes set of images and predicts for each input image belongs to which of the two categories of cancerous and non-cancerous classes.

3. An Efficient Machine Learning Approach for the Detection of Melanoma using Dermoscopic Images

Proposed method involves two main steps to perform classification of melanoma images from dermoscopic images. It mainly includes two main phases; feature extraction and classification.

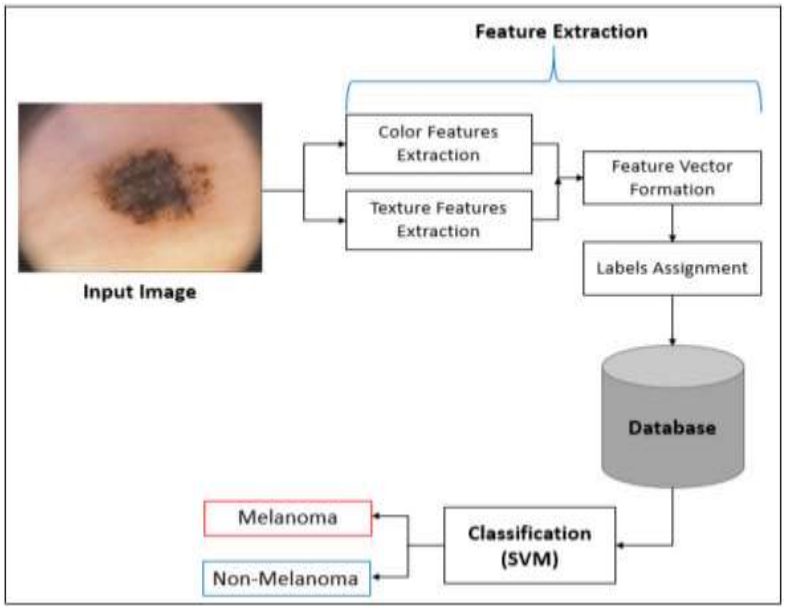

Figure 3An Efficient Machine Learning Approach for the Detection of Melanoma using Dermoscopic Images

a) Feature Extraction

Feature extraction step uses original colored dermoscopic images to extract discriminating color features (which give knowledge about color distribution and color variation present in skin lesions) and texture features (which convey knowledge about different structures present in the lesion e.g. dots, streaks, holes etc.)

b) Classification

SVM classifier is applied using the feature vectors stored into the database to classify melanoma images from given set of dermoscopic images.

4. An Automated Skin Lesion Diagnosis by using Image Processing Techniques

In this paper, different digital lesion images have been analysed 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.

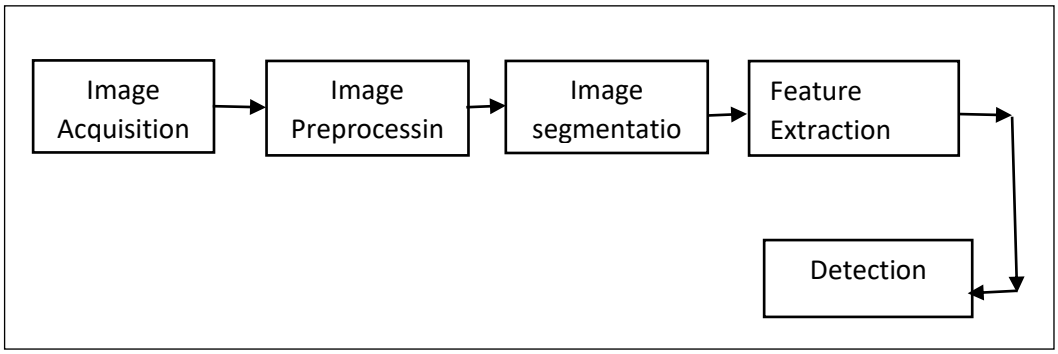

Figure 4An Automated Skin Lesion Diagnosis by using Image Processing Techniques

a)Pre-processing

Image Pre-Processing is a technique where complete analysis of the pigmented skin lesion is done. Here, by median filtering the noise reduction is done i.e. the noise which is present is removed. Gaussian Filter removes constant noise level in dark areas. 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.

b) Segmentation

By applying Otsu Segmentation Method it measure the spreading of thepixel 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.

c) Feature Extraction

Geometrical Centre is extracted to determine the coarseness, color entropy, color variance, compactness and GLRLM (grey level run length method).

d) Detection

Based on these features, the risk probability factor of the lesion is shown with the help of computer aided diagnosis system.

5. Early Detection of Skin Cancer Using Melanoma Segmentation technique

This paper describes about the performance of the proposed melanoma image segmentation techniques based on Gradient and Feature Adaptive Contour (GFAC) model to detect melanoma skin cancer in earlier stage and diagnosis of dermoscopic images. The proposed modified gradient and feature adaptive contour model can be verified against various state-of-art-techniques in terms of segmented image, error reduction and efficient feature extraction.

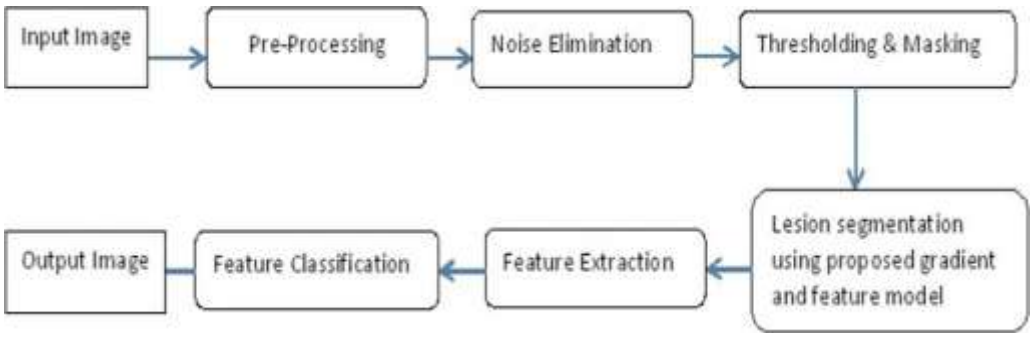

Figure 5Early Detection of Skin Cancer Using Melanoma Segmentation technique

a)Preprocessing and Noise Elimination

This techniques are introduced to decrease noise and make execution faster. This technique helps in separating the required entity from the background and gather the information from the adjacent pixels of similar classes.

b) Segmentation

Multiple Gaussian distribution patterns are adopted to extract efficient features and to get precise segmentation.

COMPARATIVE ANALYSIS

COMPARATIVE ANALYSIS OF DIFFERENT TECHNIQUES USED FOR SKIN CANCER DETECTION

PARAMETER	Paper 1	Paper 2	Paper 3	Paper 4	Paper 5
Pre-processing	Color range Normalization	Gray Scale Conversion, Noise removal, Image enhancement	Mean Filter	Median Filter, Noise Reduction, Gaussian Filter	Noise Elimation
Segmentation	Thresholding Based, Clustering Techniques, Edge Detection Based Segmentation	Maximum Entropy Thresholding	Multi Thresholding Otsu	Otsu Segmentation, Color Image Segmentation.	Multiple Gaussian Distributed patterns
Feature Extraction	ABCD(Asymmetry, Border irregularity, color and Diameter)	GLCM(Gray Level Co-occurrence Matrix)	GLCM(Gray Level Co-occurrence Matrix)	GLRLM (grey level run length method).	Gradient and Feature adaptive contour(GFAC)
Classification	TDS (Total Dermoscopic Value)	SVM(Support Vector Machine)	SVM(Support Vector Machine)	-	-

CONCLUSION

Traditional method for detecting melanoma carcinoma approach is invasive method such as biopsy of the lesion is widely used for the diagnosis purposes. Analyzing the skin lesion with the naked eye is a challenging task for the clinicians. This method is painful and time consuming. Therefore, in order to overcome the above stated issues different techniques are used for melanoma carcinoma approach. This paper describes various different techniques for the approach of melanoma carcinoma. These techniques uses computer aided diagnosis for skin cancer detection. These techniques work on image so there is no physical contact with skin, so this is non-invasive. These techniques use image processing tools for the approach of melanoma carcinoma.

REFERENCES

1. Sanjay Jaiswar, Mehran Kadri, Vaishali Gatty "Skin Cancer Detection Using Digital Image Processing", International Journal of Scientific Engineering and Research, Volume 3 Issue 6, June 2015

2. Uzma Bano Ansari, Tanuja Sarode," Skin Cancer Detection Using Image Processing", International Research Journal of Engineering and Technology, Volume: 04 Issue: 04 | Apr - 2017

3. Zahra Waheed, Amna Waheed," An Efficient Machine Learning Approach for the Detection of Melanoma using Dermoscopic Images", International Conference on Communication, Computing and Digital Systems, IEEE-978-1-5090-4448-1/17,2017 .

4. Sujaya Saha, Dr. Rajat Gupta," An Automated Skin Lesion Diagnosis by using Image Processing Techniques" International Journal on Recent and Innovation Trends in Computing and Communication, Volume: 2 Issue: 5.,2014

5. Tammineni Sreelatha, M. V. Subramanyam ,M. N. Giri Prasad," Early Detection of Skin Cancer Using Melanoma Segmentation technique", Journal of Medical Systems 43: 190,Springar 2019.

6. Ahn, E., Kim, J., Bi, L., Kumar, A., Li, C., Fulham, M., and Feng, D. D., Saliency-based lesion segmentation via background detection in Dermoscopic images. IEEE J. Biomed. Heal. Informatics, p. Accepted to be printed, 2017.

7.Fan, H., Xie, F., Li, Y., Jiang, Z., and Liu, J., Automatic segmentation of dermoscopy images using saliency combined with Otsu threshold. Compute. Biol. Med. 85:75–85, 2017.

8. ZamaniTajeddin, N. and MohammadzadehAsl, B., A general algo-rithm for automatic lesion segmentation in dermoscopy images. 23rd Iranian Conference on Biomedical Engineering and 2016 1st International Iranian Conference on Biomedical Engineering (ICBME). 134–139, 2016.

9. Jahanifar, M., Tajeddin, N. Z., Goodya, A., and ASL, B. M., Segmentation of lesions in dermoscopy images using saliency map and contour propagation. ArXiv preprint arXiv: 1703.00087, 2017.

10. Z. Yu et al., Melanoma recognition in Dermoscopy images via aggregated deep convolutional features. IEEE Trans. Biomed. Eng.

11. Nezhadian, F. K., and Rashidi, S., Melanoma skin cancer detection using color and new texture features. 2017 Artificial Intelligence and Signal Processing Conference (AISP), Shiraz. 1–5, 2017.

12. Mustafa, S. and Kimura, A., A SVM-based diagnosis of melanoma using only useful image features. 2018 International Workshop on Advanced Image Technology (IWAIT), Chiang Mai. 1–4, 2018.

13. Waheed, Z., Waheed, A., Zafar, M. and Riaz, F., An efficient ma-chine learning approach for the detection of melanoma using dermoscopic images. 2017 International Conference on Communication, Computing and Digital Systems (C-CODE), Islamabad. 316–319, 2017.

14.Yana Goncharova, Enas A. S. Attia, Khawla Souid, and Inna V. Vasilenko, "Dermoscopic Features of Facial Pigmented Skin Lesions," Hindawi Publishing Corporation, Dermatology, pp. 1-7, 2013.

15. Iris Zalaudek, M.D, Aimilios Lallas, Elvira Moscarella, Caterina Longo, H. Peter Soyer, Giuseppe Argenziano, "The dermatologist's applications traditional and new applications of ermoscopy," Dermatol Pract Concept, vol.3, no. 2, pp. 67-71, April 30, 2013.

16. Cheng Lu, Muhammad Mahmood, Naresh Jha, and Mrinal Mandal, "Automated Segmentation of the Melanocytes in Skin Histopathological Images," IEEE JOURNAL OF BIOMEDICAL AND HEALTH INFORMATICS, VOL. 17, NO. 2, pp. 284-296, MARCH 2013.

17. Catarina Barata, Margarida Ruela, Mariana Francisco, Teresa Mendonça, and Jorge S. Marques,"Two Systems for the Detection of Melanomas in Dermoscopy Images Using Texture and Color Features," IEEE SYSTEMS JOURNAL, pp.1-15, 2013.

18. Margarida Ruela, Catarina Barata, Teresa Mendonca, and Jorge S. Marques, "On the Role of Shape in the Detection of Melanomas", 8th International Symposium on Image and Signal Processing and Analysis (ISPA 2013), September 2013.

19. Catarina Barata, Margarida Ruela, Mariana Francisco, Teresa Mendonça, and Jorge S. Marques, "Two Systems for the Detection of Melanomas in Dermoscopy Images Using Textur eand Color Features", IEEE Systems Journal, May 10, 2013.

20. H. Iyatomi, H. Oka, ME. Celebi, M. Hashimoto, M. Hagiwara, M. Tanaka, and K.

Ogawa, “An improved Internet-based melanoma screening system with dermatologist-like tumor area extraction algorithm,” Computerized Medical Imaging and Graphics, vol. 32, no. 7, pp. 566-579, 2008.

21. J Abdul Jaleel, Sibi Salim, Aswin.R.B,” Computer Aided Detection 01 Skin Cancer”, International Conference on Circuits, Power and Computing Technologies, 2013.

22. Kawsar Ahmed, Tasnuba Jesmin, “Early Prevention and Detection of Skin Cancer Risk using Data Mining”, International Journal of Computer Applications, Volume 62– No.4, January 2013.

23. Maurya R, Surya K.S,"GLCM and Multi Class Support Vector Machine based Automated Skin Cancer Classification, "IEEE journal, vol 12, 2014.

24. Nilkamal S. Ramteke and Shweta V. Jain, ABCD rule based automatic computer-aided skin cancer detection using MATLAB, Nilkamal S Ramteke et al, Int.J.Computer Technology and Applications, Vol 4 (4), 691-697.

25. Md.Amran Hossen Bhuiyan, Ibrahim Azad, Md.Kamal Uddin, Image Processing for Skin Cancer Features Extraction, International Journal of Scientific and Engineering Research Volume 4, Issue 2, February-2013 ISSN 2229-5518.