Skin Cancer Feature extraction using LESH and LPQ Techniques

Gurinder Kaur Sodhi , Research Scholar , Desh Bhagat University , Mandi gobindgarh Punjab , India
Dr S .Chatterji , Retired Professor and Head Electrical Engineering Department , NITTTR , Chandigarh , India

Abstract

Skin cancer is the most common and dangerous form of cancer. It spreads to other parts of the body if it is not diagnosed at early stage . Early detection of Melanoma skin cancer is necessary for the patient . Automatic diagnosis and advancements in technology has made the early detection of skin cancer possible . The shape, colour, are most important characteristics for the detection of skin cancer. the diagnosis of skin cancers was depended on various conventional techniques which are determined in nature .A variety of diagnostic tools and supporting techniques are available to detect skin cancer. This article explains in detail the feature extraction of the image after its acquisition in order to reduce the time constraint problem . In this article features of the image are being extracted using LESH and LPQ techniques and both the techniques are being compared with their evaluated results . By comparing the results it is concluded that LPQ feature extraction technique take less time as compared to LESH technique .

I Introduction

Skin is the outer covering of human's body and is the body's largest organ. There are several types of skin related diseases. Skin cancer is one of the most dangerous skin diseases. Australia is one of many countries where skin cancer patients are found more in comparison to the other types of cancer patients . Researchers have found that Australian melanoma rates are the highest worldwide . Skin cancer is a disease where malignant cells are found in the epidermis (outer layer of the skin). Skin cancer develop due to more exposure to sun.

In this type of cancer, certain number of cells in the body get changed in their appearance , shape and function. Skin cancer is said to be the uncontrolled growth of abnormal skin cells. Immediate and adverse effect of excessive exposure to sun results in the sunburn and eye damage which indeed results in premature aging of the skin .This abnormal cell growth is called tumour. Normal skin cells are reproduced in an orderly and controlled way and new cells are formed regularly in order to replace the old and damaged cells. It is severe among the fair skinned population. Normally, new cells are divided at a controlled rate to keep the overall number of cells to be constant as nearly as possible.

In the present article a technique has been proposed for extraction of skin cancer region in order to detect the disease in early stages.
The proposed system involves the following steps :

(i) Image Pre -processing
(ii) Image Segmentation
(iii) Image Feature extraction
(iv) Image Classification

They are implemented in the following manner :
Step 1 First the image is acquired
Step 2 Image is preprocessed . In this step noise is removed
Step 3 After noise removal segmentation process is done which segments the separate skin cancer images
Step 4 features are extracted
Step 5 Image Classification is done
The selected features are provided as inputs to the Artificial Neural Network (ANN) Classifier which classifies the given data-sets into cancerous and non-cancerous.

Fig. 1 Shows the block diagram of the Skin Cancer Diagnosis

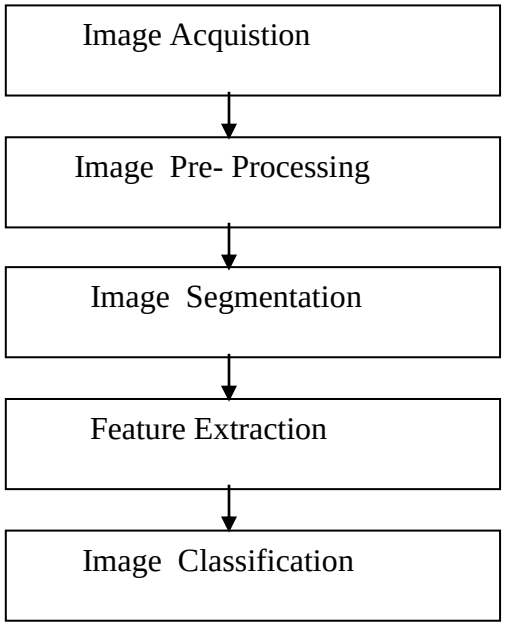

Fig. 1 Block Diagram of Skin Cancer Diagnosis

2 Feature Extraction

Feature extraction is considered as the most critical state - of the art of skin cancer screening system.

Feature extraction has been implemented in the present problem using the properties called ABCDE in automated diagnosis of skin cancer. ABCDE criterion represents Asymmetry, Border, Colour variation, Diameter and Evolution.They are discussed below :

Asymmetry Asymmetric nature of melanoma is the property in which the imaginary line passing through middle of the lesion, either up or down

or side to side provides two unequal or two non-symmetric parts.

Degree of asymmetry can be computed by using asymmetric index which is calculated by using the formula AI = ΔA × 100, where A is the total area of the image and ΔA is the difference in area between the total image and the lesion area image .

Border Irregularity The border or edge of the skin cancer affected area will be usually blurred or ragged or irregular or even notched. Border irregularity is usually calculated by compact index in medical image processing. Compact index is used to estimate unanimous 2D objects.

Colour Variation Emergence in colour variation can be detected if lesion is melanoma. The colours can be variations in black, brown and red depending on the production of melanin pigment in the affected area.

3 Local Phase Quantization(LPQ)

The Local Phase Quantization (LPQ) was anticipated by Ojansivu and Heikkila based on texture information . LPQ technique is based on the blur invariance property that is based of the Fourier phase spectrum. the local phase information is extracted using the 2-D short-term Fourier transform (STFT) computed over a rectangular area at each pixel position of the image. In this technique Only four complex coefficients are considered corresponding to 2-D frequencies.

4 Local Energy Based Shape Histogram Feature Extraction (LESH)

Local Energy-based Shape Histogram Feature Extraction (LESH) was launched by Morrone, M.C. & Owens, R . LESH technique is implemented by converting an image into a combination of local energies along with different orientations that involves features extraction at points of maximum phase congruency . The output of signal determines the type , sign , contrast and amplitude of feature of local maxima of the energy function .

5 Results

The results has been obtained by using original image implementing LESH and LPQ technique .

Fig. 2 (a) shows the Original Image with LESH Feature Extraction Graph , Figure 2(b) shows the Original Image with LPQ Feature Extraction Graph.

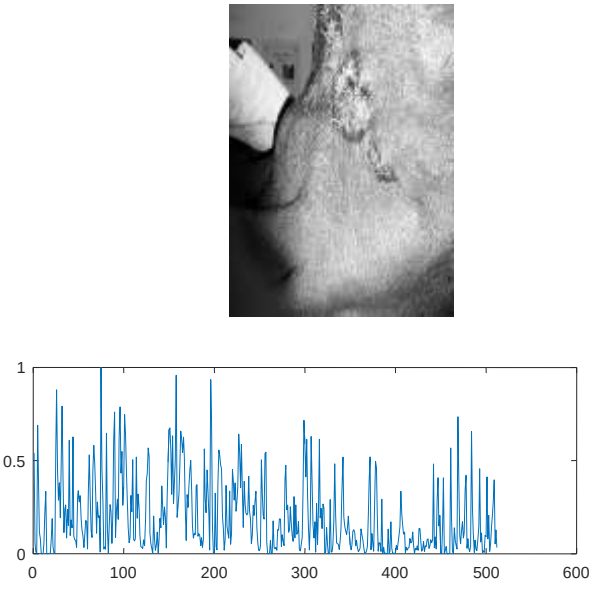

Fig. 2(a) Original Image with LESH Feature Extraction Graph

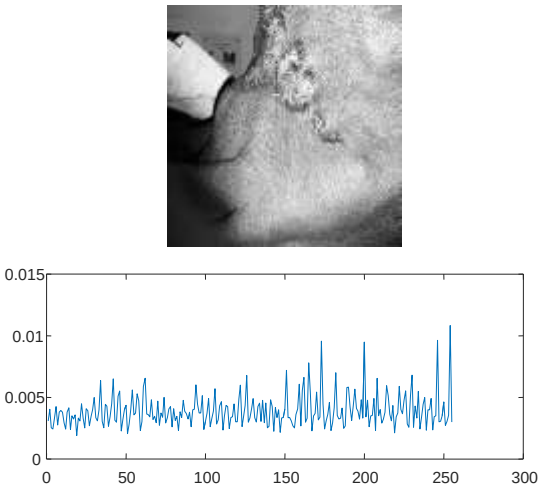

Fig.2(b) Original Image with LPQ Feature Extraction Graph

Fig. 2 First Image Results of Time Taken for Feature Extraction for Skin Cancer Images of LESH and LPQ Feature Extraction

Fig. 3 (a) shows the Original Image with LESH Feature Extraction Graph , Figure 3(b) shows the Original Image with LPQ Feature Extraction Graph.

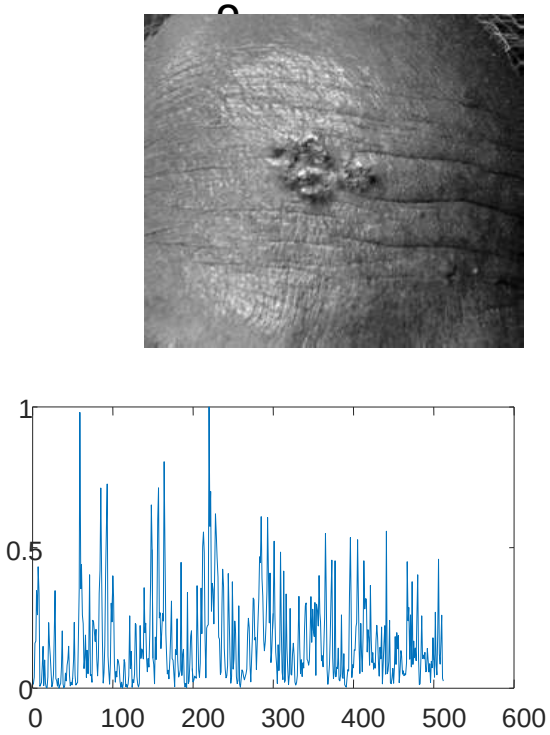

Fig. 3(a) Original Image with LESH Feature Extraction Graph

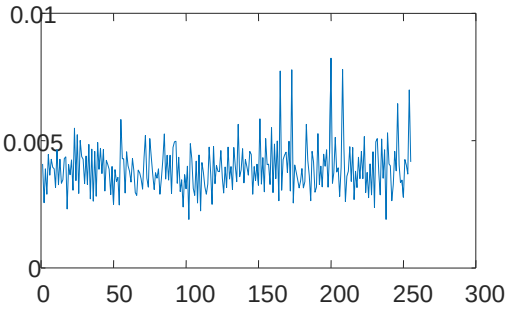

Fig. 3(b) Original Image with LPQ Feature Extraction Graph

Fig. 3 Second Image Results of Time Taken for Feature Extraction for Skin Cancer Images of LESH and LPQ Feature Extraction

Fig. 4 (a) shows the Original Image with LESH Feature Extraction Graph , Figure 4(b) shows the Original Image with LPQ Feature Extraction Graph.

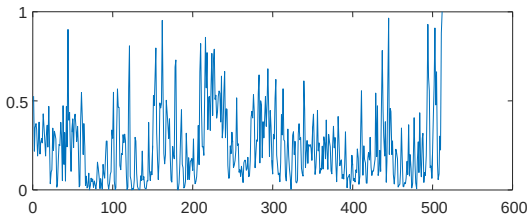

Fig 4(a) Original Image with LESH Feature Extraction Graph

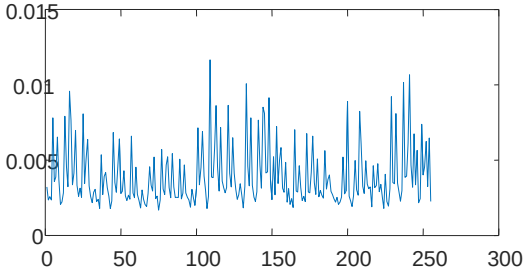

Fig 4(b) Original Image with LPQ Feature Extraction Graph

Fig. 4 Third Image Results of Time Taken for Feature Extraction for Skin Cancer Images of LESH and LPQ Feature Extraction

Time taken for the 1 st , 2nd , 3rd images regarding LESH and LPQ and also the total time taken are shown in Table 1 .

Table 1 Results Regarding Feature Extraction for Skin Cancer Images for LESH and LPQ Feature Extraction

Image	Time taken for Lesh feature extraction (Seconds)	Time taken for LPQ feature extraction (Seconds)	Total time taken for feature extraction (Seconds)
1st	0.5236	0.0364	0.5601
2 nd	0.5183	0.0418	0.5601
3 rd	0.5015	0.0371	0.5385

6 CONCLUSION

From the evaluated results it is concluded that LPQ Feature extraction takes less time to extract the features as compared to LESH Feature extraction technique . So LPQ feature extraction technique is preferred over LESH feature extraction technique .

References

(1) Nikita Raut, Aayush Shah, Shail Vira, Harmit Sampat , "A Study on Different Techniques for Skin Cancer Detection " International Research Journal of Engineering and Technology (IRJET) Volume 5 , Issue 9, September 2018 , pp 1-5.

(2) Poornima M S , Dr. Shailaja K , "Detection of Skin Cancer Using SVM "International Research Journal of Engineering and Technology (IRJET) , Volume 04 , Issue: 07 , July 2017 , pp 1-4.

(3) Omar Abuzaghleh,Buket D. Barkana,and Miad Faezipour , "Noninvasive Real-Time Automated Skin Lesion Analysis System for Melanoma Early Detection and Prevention" IEEE Journal of Translational Engineering Health Medicine , Vol 3 ,Issue 03, April 2015, pp 1-10.

(4) Hina Sood , Manshi Shukla ," An Approach For Detection of Skin Lesions from Digital Images Using Genetic Algorithm" , Global Journal of Advanced Engineering Technologies, Vol 3, Issue 3 , 2014, pp 1-5.

(5)Asmaa Aljawawdeh , Esraa Imraiziq , Ayat Aljawawdeh , "Enhanced K-mean Using Evolutionary Algorithms for Melanoma Detection and Segmentation in Skin Images "International Journal of Advanced Computer Science and Applications, Vol. 8,Issue 12, 2017, pp 1-4.

(6) Palak Mehta , Bhumika Shah, "Review on Techniques and Steps of Computer Aided Skin Cancer Diagnosis" International Conference on Computational Modeling and Security (CMS 2016) , ELESEVIER , Science direct ,Procedia Computer Science, Vol 8, Issue 5 , 2016, pp 309 – 316.

(7) Chandrahasa M, Varun Vadigeri , Dixit Salecha , " Detection of Skin Cancer Using Image Processing Techniques " International Journal of Modern Trends in Engineering and Research (IJMTER) , Vol 3 , Issue 5 , 2016, pp 111-114 .