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Skin Cancer Detection Using Air – PC with Inbuilt MATLAB[®]

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ABSTRACT: Microscopic level testing and visualization of skin cancer by Biopsy method is the most painful and late detection process. Skin Cancer occurs due to DNA damages of skin cells or genetic disorders. To overcome the painful biopsy method Image processing technology can be used to detect the presence of skin cancer and type of it, using the images itself. This can be done using Image Processing Toolbox in MATLAB[®]. In this project we are analysing whether the input image is a Skin Cancer or not. This can be analysed based on Colour parameter of Cancer cells which is one of the basic parameter among the four basic parameters of Skin Cancer. They are Asymmetry, Border, Colour and Diameter [ABCD]. The input image given to MATLAB[®] is called as Skin Lesion Image. The extracted feature image by GABOR WAVELET can be detected as Skin Cancer cell based on the Colour of the image. The image is classified using Support Vector Machine (SVM) classifier. We predict to obtain [90 – 100]% accuracy. Further this is converted into a handheld device with the help of Air – PC containing inbuilt MATLAB[®] connected to a display touch screen for immediate visualization of result.. From this paper proposal it is believed to obtain a device for skin cancer detection .

KEYWORDS: Skin Cancer Lesion, Image Processing Technology, MATLAB and Colour Parameter.

I. INTRODUCTION

In recent days skin cancer has become a common and unbounded destructive and malignant growth of the skin. It emerges from cell of the membrane that lies between the superficial layer of the skin from deep layers. The malignant melanoma has the potential to spread along other parts of the body and can become life threatening. There are three major types of skin cancer they are 1) basal cell carcinoma, 2) Squamous cell carcinoma and 3) melanoma [1] among which melanoma is the most dangerous and life threatening type of skin cancer.

Melanoma arises from the melanocyte pigment producing skin cells. This type of cancer is also named as malignant or cutaneous melanoma. Most melanoma cells produce melanin, so melanoma cancers are usually brown or black. But some melanomas do not secrete melanin and can appear pink, tan, or even white (courtesy from American Cancer Society). Melanoma is 20 times more common in whites than other skin coloured people in all around the world. Overall, the lifetime risk of getting melanoma is about 2.5% (1 in 40) for whites. The risk of melanoma increases as people age. The average age of people when the disease is diagnosed is 63 (courtesy from Wikipedia).

In the medical field melanoma detection is done by means of Biopsy which is very painful and tedious testing method. In order to overcome this testing methodology a technical image processing method have been developed. Now it become widely used method for skin cancer detection. The system based diagnosis is more accurate as well as a fast process. The detection technique used in this paper is based on the diameter parameter of the ABCD rule.

The main steps in this detection method involves image acquisition from the input skin lesion and segmentation of the infected skin from the skin region. Segmentation or border detection is the process of identifying and segregating the skin lesion from the normal skin region of the skin lesion. Further image extraction process have been done to acquire the final perfect measured regional malignant melanoma infected region in the image from the input infected skin lesion image.

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Not only making this process as a system based detection but also to convert it into a handheld device detection using Air – PC further have been done and explained in this paper.

In order to explain the further steps in the detection of differentiation between the skin cancer and normal skin the processing has been done using the image processing toolbox of the MATLAB[®] software. The image which is going to be detected is represented in the Figure



Figure 1 – Skin Lesion Image

II. METHODOLOGY

The step by step procedure for skin cancer detection using image processing technology is detailed. The infected skin lesion image is given as input, the colour parameter is taken as the basic property in the detection process. In this detection methodology many conversion processes take place where the pixel colour values are converted into digital vector values. Those values are called as Feature Vector Values. The conversion process is called as Feature Extraction. This process explains each and every minute conversion of pixel colour into a vector value.

A set of input images is fed as a data set and converted into a database. The conversion process includes many steps like correlogram, histogram, colour moments, Gabor Filter etc. Where each and every pixel value has been converted into machine level digital values using MATLAB[®]. In this process the program code actually performs like a real time electronic circuit which analyses the quantity of each colour in the image and removes noise by doing so. The image values are completely converted into numerical digital values. This is done only with the software without help of any hardware. Then based on the input set of test images a range is analysed for each type of cancer and classified using SVM Classifier. This detects the type of skin cancer.

III . PROPOSED ALGORITHM

A. Design Considerations:

- Set of Input Image.
- Database Creation.
- Feature Extraction.
- Image Pre - Processing.
- Histogram.
- Auto Correlogram
- Colour Moments.
- Gabor Wavelet Form
- Feature Vector Formation
- SVM Classifier
- Cancer Detection

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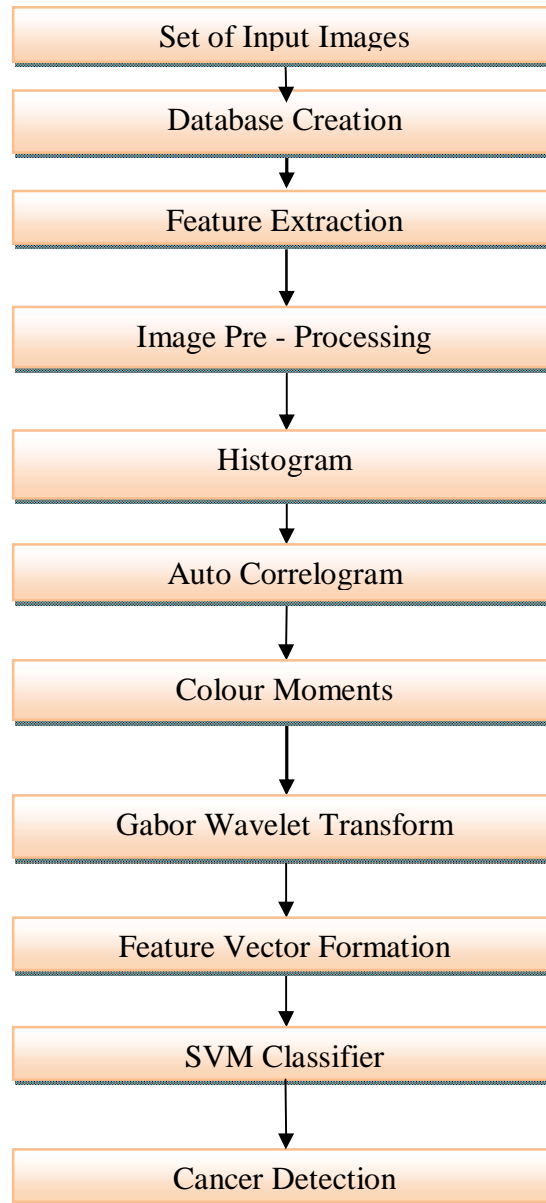


Figure 2 – The Flow of Skin Cancer Detection Using SVM

III . DATABASE CREATION

The images that has to be tested is organized into rows, columns and tables, and it is indexed to make it easier for finding relevant information. A set of images for each type of cancer is fed for testing which is converted into vector values by the feature extraction process.

IV. FEATURE EXTRACTION

The extraction of geometric values from each skin lesion image is the feature extraction process [1]. Each and every pixel value is converted into digital values. The basic geometric feature used is colour.

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A . Image Resize

The original image is resized to a pixel ratio of 256 * 256 in order avoid the unwanted objects. To concentrate on the infected pixels alone so that more data can be collected.

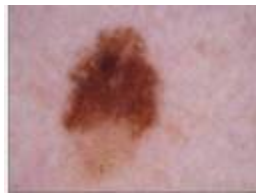


Figure 2 - Resized Image

B . Histogram

This is the process of analysing the quantity of each colour in the image. It defines the underlying frequency of each colour. Whereas it is plotting methodology. The histogram is constructed by means of splitting the data intervals of continuous data called bins, which give the digital values.

C . Auto Correlogram

This shows the collection of data in the time axis. Serial correlation is done to analyze where an error at one point in time travels to a subsequent point in time. This gives the time axis data of the image .

D . Color Moments

It describes the probability distribution of colour in the image. This process is used to differentiate two images based on colour. The database of each image is compared in order to retrieve similar image.

E . Gabor Wavelet Transform

This is also known as the Gabor Filter. This transformation is used to define the data in both frequency and time domain. This allows to minimize the information carried by the data so that more detailed data can be analyzed.

F . Feature Vector Formation

By processing the image by listed methodology , it is completely converted into numerical value that's called as the feature vector value.

	1	2	3	4	5
1	0.0615	0.0028	6.7746e-04	1.5755e-04	1.5755e-04
2	7.9987e-04	9.4103e-05	1.0979e-04	3.1368e-05	1.0979e-04
3	0.1428	0.0186	0.0035	0.0035	9.3358e-04
4	0.0687	0.0259	0.0073	0.0055	0.0019
5	0.0908	0.0244	0.0028	4.6740e-04	4.6740e-05
6	0.0048	2.6623e-04	7.8304e-05	3.1321e-05	1.4095e-04
7	0.0131	0.0011	4.3829e-04	6.5743e-04	0.0015
8	0.0026	4.7645e-05	3.1763e-05	4.7645e-05	2.8587e-04
9	0.0169	0.0023	0	0	1.8716e-04
10	0.0030	0.0193	6.6185e-04	1.6546e-04	0.0041
11	0.0154	4.5244e-04	3.1203e-04	1.2481e-04	7.1766e-04
12	0.0242	0.0072	0.0035	0.0055	0.0030

Figure 4 – Feature Vector



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V . SVM CLASSIFIER

This classifier is used mainly used to classify the image based on colour . After going through all the methods a value for each type of cancer is obtained. Where each type of cancer covers a range of data based on the data the cancer type is detected.

VI . MATLAB® IN AIR - PC

In order to make a device for skin cancer detection air - pc which has intel Z3735f Atom processor is used. The MATLAB® is installed in it and connected to a display touch screen so that the captured image can be processed at anytime and at any situation instantly.



Figure 5 – Detected Result

VII . CONCLUSION

From this paper its is concluded that by doing these analyze on the image, the presence and the type of cancer is detected. That is assured by the test images

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