DETECTION OF MELANOMA SKIN CANCER BY EXTRACTING FEATURES FROM CANCER IMAGE

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Abstract

Melanoma Cancer is one of the deadliest form of cancer. Out of 75% deaths caused by cancer, 4% are because of melanoma. Melanoma is one of type of skin cancer that usually develops from prolonged exposure to UV light. The frequency of melanoma cancer is rising in many countries where the factors like tanning and sun exposure make possible their appearance in young people. It is relatively easily curable if it is detected in its early stages, however if diagnosis is late, melanoma grows deeper into the skin and the risk increases. This form of cancer is most prevalent in countries like Australia, USA. In this paper we discussed about various popular algorithms used to detect melanoma cancer and propose a new system that combines these algorithms together in one system. These algorithms are proposed by expert doctors.

7-Point, Menzies, BLINCK algorithm, dermatoscopic images.

I. Introduction

Melanoma, also known as malignant melanoma. It is a type of cancer that develops from the pigment-containing cells known as melanocytes. Melanomas typically occur inside the skin but may rarely occur in the mouth, intestines, or eye. In women they commonly occur on the legs, while in men they are common on the back of the body.Sometimes they develop from a mole with concerning changes including an irregular edges,increase in size, change in color, itchiness and skin breakdown. Melanoma is one of the most dangerous types of skin cancer and its frequency is rising in many countries where the factors like tanning and sun exposure make possible their appearance in young people. It is relatively easily curable if it is detected in its early stages, however if diagnosis is late, melanoma grows deeper into the skin and the risk increases. However, this method is 75-84% accurate and depends heavily on the experience of the physician.

Melanoma is a skin cancer that begins in melanocytes. Melanocytes produce the dark pigment called melanin which is responsible for colour of the skin. It can originate in any part of the body which contains melanocytes.

To overcome this many studies have done. The issue of early stage melanoma detection using digital image processing techniques combined with machine learning algorithms. Several approaches have been proposed to differentiate melanocytic lesions from malignant melanoma. Skin imaging technology has improved in recent years, encouraging researchers to develop a non-invasive computer-aided diagnosis (CAD) for melanoma detection based on lesion's features.

II. Related Work

Image Processing

Image processing is one of the most important concepts in coumputer-aided detection of melanoma cancer. Once the dermatoscopic image is obtained from the dermatoscope, the image need to be smoothened using various filters. Various filters according to the algorithms need to be extracted and checked for. The algorithms discussed below are based on the fundamentals of image processing.

These filters involve digital signal processing functions like convolution.

III. Goals and Objectives

Goals:

To develop an application that takes dermatoscopic image as input.

To create and develop image processing module that scans the image and checks for the

melanomatic features.

To develop whole system or application user-friendly for people affected with melanoma cancer.

To develop a system that easily determine whether the affected region is cancer or simple lesion or mole.

Objectives:

To study and implement various image processing filters and function.

To develop python program without any bug and error.

To study about various algorithms involved in melanoma cancer detection.

To increase accuracy of previous system

IV. Algorithmic Survey

1. MENZIES METHOD:

Menzies method is useful for detection of skin cancer, especially melanoma cancer. There are various aspects of Menzies method for detecting the cancer. The algorithm consists of two points for detection. Positive-Points & Negative-points, Negative-Points are the points which deny the presence of melanocytes. Positive-Points are those features of skin lesion which resembles the melanoma cancer. For melanoma to be present it should have at least one or more of the Positive-Points. Negative-Points states that there are no presence of melanoma cancer.

NEGATIVE POINTS FOR MELANOMA CANCER:

For melanoma to be diagnosed a lesion must have neither of both negative feature

- Symmetry of patterns.
- Presence of single colour.

POSITIVE POINTS FOR MELANOMA CANCER:

For melanoma to be diagnosed lesion must have 1 or more of the following feature

- Blue-white veil
- Multiple brown dots
- Pseudopods
- Radial streaming
- Scar-like de-pigmentation
- Peripheral black dots/globules
- Multiple (5-6) colours
- Multiple blue/gray dots
- Broadened network

2. 7 POINT CHECKLIST ALGORITHM:

The seven point check list is the diagnostic method which requires identification of seven dermatoscopic criteria of the image. A scale is define from 1 to 7, which uses major and minor criteria to grade the lesion. Presence of major criteria adds two points and presence of minor criteria adds one point. If the score of the lesion is at least three points then that lesion is malignant.

Criteria	Points
Major	2
A typical net pigmentation	2
A typical Pattern	2
Blue-white veil	1
Minor	2
Irregular streaks	1
Irregular pigmentation	1
Irregular spots/globules	1
Areas of Regression	1

If score <3 chances for melanoma are very less.

3. ABCDE ALGORITHM:

ABCD feature is the important information based on morphology analysis of the lesion and calculation of Total Dermatoscopic Value (TDV). ABCD feature is Asymmetry, Border Irregularity, Colour variation and Diameter features described as follows:

1) Asymmetry: The image is divided into two perpendicular axes that are positioned in such a way so that they produce a lowest possible asymmetry score. If the image shows asymmetry properties with respect to axes, the asymmetry score is 2. If image shows asymmetry on one axes then the score is 1. The score will be 0, if asymmetry is absent.
2) Border: The image of the lesion is divided into eighths and a sharp, abrupt cut-off of the pigment pattern at the periphery within one eighth has a score 1. Image with score 0 has a gradual, indistinct cut-off.
3) Colour: Cancerous skin is characterized by three or more colours. Black, Blue-Grey, Dark Brown, Light-Brown, Red and White are counted in the colour score. About five six colours are present in malignant melanoma.
4) Diameter: A malignant lesion will have diameter more than 6mm. Once all the features of ABCD are evaluated for the image, the calculation of TDV score is done. TDS is a uniform system used for dermatoscopic assessment and is defined by:

TDS = A * 1.3 + B * 0.1 + C * 0.5 + D * 0.5[5]

It is used to access the lesion and gives information about the lesion whether is mild, suspicious or malicious. A high ABCD score means a lesion is more likely to be malignant melanoma (TDS > 5.45)

5) Evolution: The evolution of your mole(s) has become the most important factor to consider when it comes to diagnosing a melanoma. Elevation means the mole is raised above the surface and has an uneven surface. Looks different from the rest or changing in size, shape, color.

Fig. No.12 Survey paper-Different steps of ABCDE algorithm

4. BLINCK Algorithm:

The BLINCK algorithm is the most recent algorithm. This algorithm takes into account more general and the points that were not considered in the other algorithms. The various points considered under BLINCK algorithm are:-

B – Benign

It means that is the blob already identified as a known tumor or not (If yes don't check further points)

L – Lonely

Is the blob only the one in the particular area (If

yes score=score+1)

I – Irregular

Asymmetrical pattern and >1 color? (If yes add 1 to score)

N – Nervous

Is the patient nervous and has family background of melanoma? (Yes, add 1)

C – Change

Does the lesion change its colour/position? (Yes, add 1)

K - Known clues

Does it have any other known clues to Maligency? (Yes, add 1)

A score of 2 or more means melanoma cancer may be present. Consult the doctor immediately

VI. Conclusion

Thus, by using different algorithms in a single system, the accuracy of the system can be increased. Also, the new system can be very helpful to the general public and to the doctors in determining whether melanoma cancer is present or absent in the early stages. The mentioned system requires no prior knowledge of melanoma cancer, image processing or computers whatsoever but is very efficient in determining whether the input image is of melanoma cancer or not.

VII .Reference

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