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Skin cancer detection using Image Processing in ML

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ABSTRACT

Skin cancer nowadays is becoming one of the biggest threats for human lives. Various people across the world are being affected by skin cancer and losing their lives. Skin cancer basically can be divided into 3 categories namely - Melanoma, basal, Squamous cell Carcinoma, Melanoma is the most dangerous type of skin cancer among the above types. As the world is developing day by day there are various new technologies developed to treat and to detect skin cancer. As skin cancer in earlier days was not so easy to detect as, skin cancer is basically a spot or a patch on any part of the skin, which can easily be confused with a mole or some sort of birthmark, and so can easily be neglected and if skin cancer not detected at correct time can be very fatal and at if reached at extreme case leads to death. Through this peer we will be discussing about one of the process known as dermoscopy, used to detect skin cancer. There are various other methods to detect or diagnose skin cancer few of them are sonography, confocal microscopy, Raman spectroscopy, fluorescence spectroscopy, terahertz spectroscopy, optical coherence tomography, photography, etc. In short dermoscopy works as of providing clear picture of the skin inner layers and help in proper and accurate detection of skin cancer.

Keywords: Melanoma skin cancer, Dermoscopy, Image processing, Malignant melanoma, Sonography.

I. Introduction

Skin cancer occurs due to abnormal growth of skin cell, and this leads to spreading of skin cancer. The skin cell can get damaged in various ways and one of the most common reason is ultra violet rays. Ultra violet rays damage the DNA of the skin cell, which can be further cured and leads to skin cancer. Most skin cancer patients are found in countries like US and Australia. Melanoma is the deadliest of all type of skin cancer, if melanoma is not recognized and removed at early stage, it can easily spread in all parts of body and hence becomes very difficult to cure. Melanocytes is basically the reason for development of Melanoma cancer, i.e., if melanocyte is present in any part of the body it will lead to Melanoma cancer. As we have observed until now whether it is any kind of cancer early detection of it and taking proper preventive measures regarding skin cancer can cure it easily. This is the place where Dermo sensor a device following the principle of dermoscopy comes very handy for detection of cancer accurately as compared to the naked eyes. Detecting skin cancer using dermo sensor can be advantageous in various ways, as one the key advantage of dermo sensor

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as we know is how accurate it is in detecting cancer. [1],[16] Other advantage is that it can be used easily by a normal physician, who is not specialized in dermatology, and this can be useful for people who can't afford such high fees to meet a proper dermatologist for just check-up, once general physician confirms a person has skin cancer than he or she can directly go for treatment of it to a proper dermatologist. Although a general physician can't be so accurate about what kind of skin cancer, the person is suffering from, but by using dermo sensor we can get a rough idea. Now we need to have an idea regarding how dermo sensor can be so accurate and why can't a normal camera or human eye can't be so accurate , the most basic answer to this question is the reflection property of our eyes and same is for normal cameras , in our eyes stratum corneum has reflective property , but when we use dermo sensor it use polarized light which easily reduces the reflective property , i.e. the polarized light don't get reflected back from the surface of the skin and it can easily penetrate through the various skin layers and we can get some clear vision of the underneath layer of our skin and this leads to accuracy in detection of the various type of skin cancer . In dermo sensor we also have non - polarized light which helps the dermatologist if they want to check only few top layers of the skin.

II. Related Work

There are a number of researchers who are working on computer screening to detect skin cancer since a long time. For separation of the change in a bodily part or an injury to a living tissue in the already used methods the approaches that are used can be either using fully human intervention or fully without that i.e. fully automatic. Skin lesion separation can be done using either shape, or colour or the glowing feature. For checking out the features many techniques are reported that include histogram inhibition, the thresholding technique used worldwide for the channels of colours.[8] Various imaging or the image enhancement processes are used for detecting the required features. In [5], some papers the writers of the papers have made the default method for obtaining a Global boundary in dermoscopy pictures according to colour space study, land bar graph showing good results in obtaining boundaries of malignant tumour that is associated with skin cancer's detection. In [10], the previous papers writers applied the process of separating the inclusion image by variety important clinical regions use Euclidean distance transformation to extract colour and texture features. ABCD Act for dermoscopy [3], suggests that absence of symmetry part is given the highest priority amongst all the aspects, boundary inequality, and width. Much research has been done on measuring that absence of symmetry part in skin diseases detection. In few techniques, the measurement factor is calculated by using geometric values for entire wound, for example equilibrium measurement, rotation. Some researchers suggest an indication of rotation, as a measure of boundary irregularities in dermoscopy. This paper [11] provides a brief idea of the most primary initiatives in the literature and also contrasts the performance of several classifiers in specifying skin problems.

III. Categories of Skin Cancer

Skin cancer has been divided in 3 categories named Basal cell Skin cancer, Squamous Skin cancer and Malignant type skin Cancer. From the above-mentioned methods, the first and second are grouped together as nonmelanoma type of cancers. The treatment process for these all types of cancers are given below. The death and the types of cancer present is also a

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key point to note to understand what the conditions and causes of each of these could be as seen in fig 1. And fig 2.

Basal cell skin cancer:

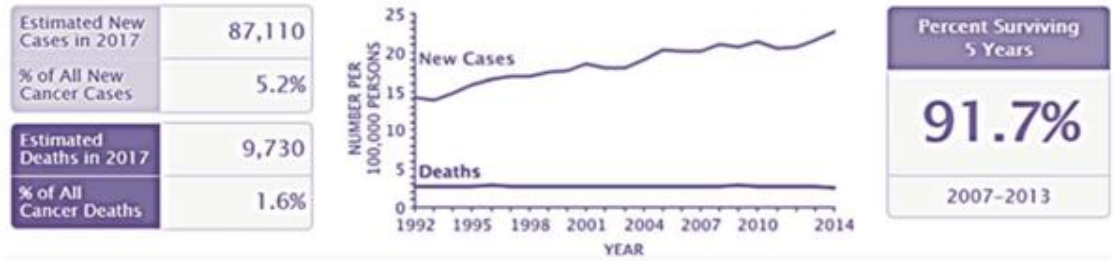

Fig 1. Deaths with Cancer

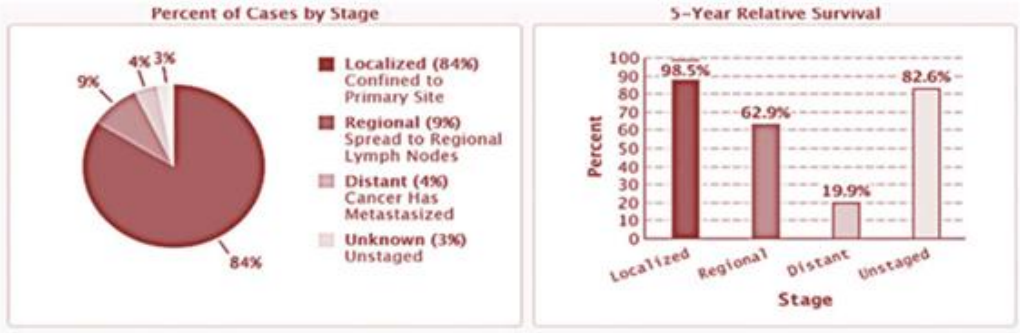

Fig 2. Case Percentage

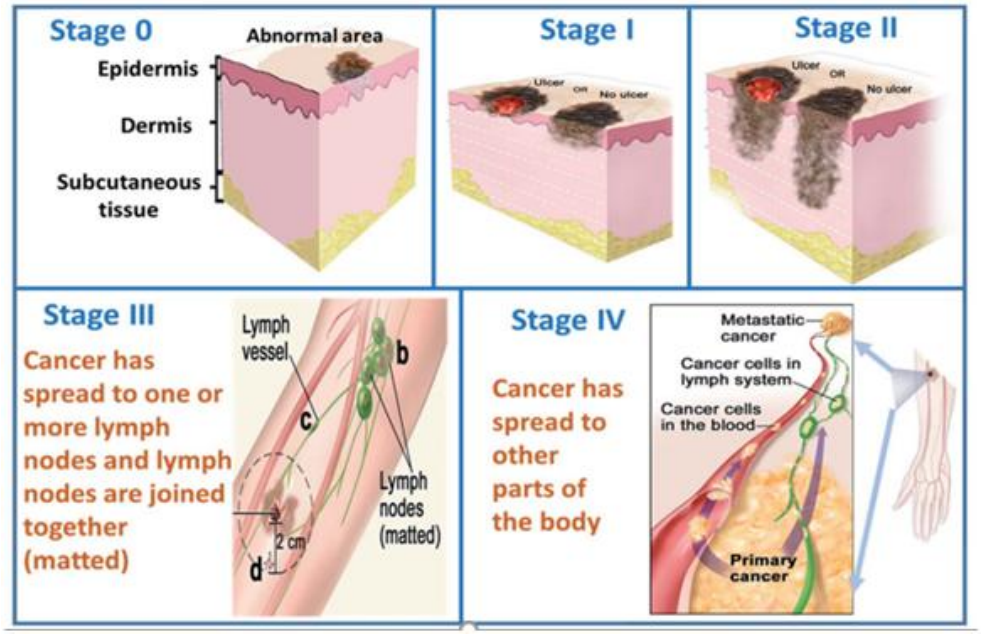

Fig 3. Stages Involved in Skin Cancer

Basal cancer cell that is also known as BCC is formed from Basal Cell Carcinoma. This starts spreading by beginning from the basal cells. It looks pink in colour or like a risen part or like pearl that is fleshy and has colour over it. It occurs in those parts which come in contact of

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direct sunlight areas like our face, forehead, etc. In this our whole body is affected as it grows within our bones. It is also called non-melanoma cancer.[6] Every year this type of cancer kills at least 2 million patients of this cancer. Although its mortality rate is lowest from other cancer types. This can be treated using a simple techniquei.e. using the radiation therapy or also using the tropical medications to get better results.

Squamous cell carcinoma (SCC):

This type of cancer is another most popular type of cancer which can be detected in those parts that has tanning or have been harmed from the ultra-violet rays. This skin cancer has a very slow developing rate. It is not like the previous one that was only affecting the bones rather it may affect our tissues, bones and even lymph nodes. It becomes difficult to treat SCC if not detected early. Its mortality rate is higher than BCC but lower when compared to Malignant Melanoma's mortality rate.

Malignant melanoma:

This cancer type is deadliest skin cancer among all the skin cancer types. The melanoma is obtained when cells that produces pigments are detected to be cancerous. Its symptoms are usually an unwanted growth in a mole. It grows very fast and can damage the surrounding tissues of the body. It is caused because of the ultraviolet radiation and harms our DNA. Although these Melanomas don't have a fixed position where they occur in our body. It may be found in any of the body parts. According to the reports of 2012, this type of cancer was found in 2,32,000 people in which 55,000 lost their lives. It can be treated by radiation methods, surgery, by normal medication can also it can be cured and sometimes chemotherapy is suggested by doctors to cure this cancer.

IV. System Flow Diagram

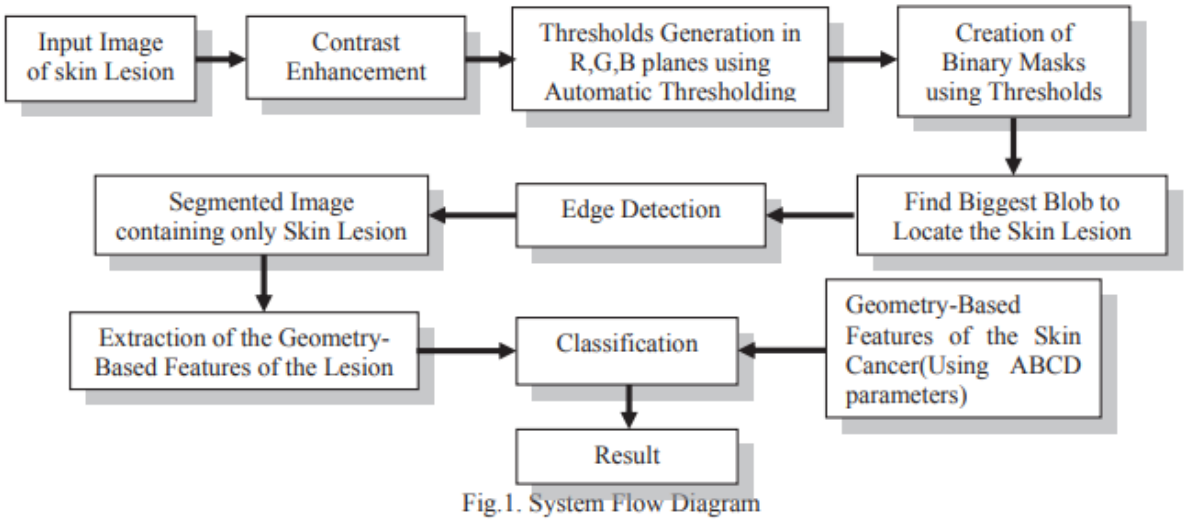

Fig.1. System Flow Diagram

V. Principles and MethodologyUsed

Optical:

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A light ray is emitted from the source of light and hence is passed from the tissues and because of deviations it gets spread all over and hence scattered inside the tissues on skin surface.[13] For treating the cancerous tissues many new technologies like the biochemical markers are used. These methods use a definite wavelength for increasing the contrast feature of the tissues in the body using absorption of light phenomenon.[14],[15]

Photodynamic based:

For detecting if any particular cell is having tumour or not, specific type of marker called the Photosensitive marker is being used. Due to the continuous chemical activities taking place in our body a chemical called Protoporphyrin IX is obtained as an outcome, the healthy cells inhale this chemical that causes no loss but the tumour causing cells collect this chemical at the bottom of the cell parts. When a device called Resectoscope is used for detecting any anomaly in a definite part so the part where tumour cells have collected the chemical will appear to be in red colour and the remaining parts will be in blue colour. For providing a unique visibility to the features of photodynamic diagnosis detection method also known as PDD, a yellow colour filter is used that marks the red part.[12],[16]

Sonography:

A Sonography is a medical test used for diagnosis which uses sound waves of relatively high frequency known as the ultra sound waves specially used when scanning of internal parts is required. In this project also we are using this approach. The procedure goes on like this- firstly sound waves are transmitted inside the body, from which some of the waves are bounced back and the remaining waves travel forward until they are stopped by some obstacle, after which they are also bounced back. The Properties of sound wave are taken into consideration deeply in this technique. This technique is used for identifying whether the skin is having any anomaly deeply or not, after which biopsy is done also it is used for detecting if the surrounded nodes of the lymph are cancerous or not.

Electrical bio-impedance:

When the electrodes are spread over our skin, using that we measure the electrical impedance for the same. But then the impedance is overtaken by the stratum corneum's large amount of resistance. After doing some modifications inside stratum Corneum Hydrated features, the electronic calculations can be done at a minimal frequency. If the living epidermis is to be observed, the equipment has to pass Stratum Corneum. Microneedles are put inside the stratum corneum to observe the electrical movements in the body.

VI. Working

Dermoscopy is basically known by various different names few of them are dermoscopy, epiluminescence microscopy. Dermo sensor is a device used to detect lesion; lesion is basically a technical term used in medical field which describes about any damage occurred in tissue. Dermoscopy shows inner surface structures of the skin, which makes the result most accurate. Dermo sensor basically consists of equipment's like

-> Magnifier glass: It is used in observing the infected area of the skin. It is much better if magnifying property is higher as it will help in detecting lesion easily and accurately.

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-> Light Source (polarized and on - polarized): The light source is one of the most important components in dermo sensor. Non - polarized light is basically used in checking up of the upper layer of the skin as it may be necessary for detection of lesion or infected area. Non - polarized light has too much reflective property so the light gets easily reflected back from the surface of the skin and as it is important to know how deep or which part of the inner surface is affected by the skin cancer, so here is the place where polarized light comes in handy. Polarized light can easily penetrate through the surface of the skin and those light getting inside the surface of the light gives a clear picture of the sub surfaces of skin.

->A transparent plate

->It is present in between the device and the skin for avoiding the bouncing back from the skins, also the medium is liquid. Although now-a-days liquid medium can easily be avoided as in order to avoid reflection of light from the surface, we can use polarized light which the device simpler and more effective.

Dermo sensor process details in three steps - first non-polarized light is used followed by two steps involving polarized lights. Then only dermatologist can come to some kind of conclusion.

Dermoscopy plays a very important role in detecting the skin cancer and the results obtained through it are very accurate if we compare it to clinical analysis. Dermo sensor uses various analysing tool such as pattern analysis which is most prominent in case of dermoscopy to differentiate between normal cell and melanoma cell, which is very critical part of dermo sensor. It plays a major role for diagnosing the melanoma condition in the pregnant ladies. A research had been done on pregnant ladies and the outcomes proved that pregnancy causes an effective growth in pigmented skin anomalies. A significant detection method called the border detection method is used throughout the dermoscopy process for increasing the accuracy in determining the required skin cancer which can be used widely for determining non-melanoma skin cancer that are SCC as well as BCC which means these types of cancers are detected by dermoscopy methods because it has very high resolution. After using this technique, if any irregular streaks in melanoma is present it can be diagnosed if we use a technique called 3-way classification of the streaks which has a regular, absent and irregular part inside skin lesion.[15] The Deep convolutional neural network is being used to classify a melanoma or a non-melanomas skin cancer.[16]

Advantages of Dermoscopy:

1. Dermoscopy can be easily used by general physician to detect skin cancer, this shows that dermo sensor is simple to use.

2. Gives a very accurate analysis of the skin cancer, even reduces minute chance of error in the detection.

3. Makes it affordable for everyone to have check-up for skin cancer, this will further help in reducing cases and also deaths related to skin cancer.

VII. Result

First, a Skin Lesion Mask is made and provided to the input image for obtaining a split output image. The skin transplant image is well separated from both mole and Melanoma cancer

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screen using the proposed method of differentiation. Fig 5. Contains the actual optical image that is taken by the camera. Further fig 6. Shows the mask created on the optical image. The next step involves the detection of a blob that is Created by the sensor and the output of which is shown in fig 7. Then we will utilize the image we already have to find the edges that is created and shown in fig 8. In fig 9. There is a representation of how the cancer will be detected using all the other images and processing those images. Fig 10. Shows an example of a healthy skin cell. Hence, we can determine skin cancer using this method as it is an effective and automated process

Fig 5.

Fig2.These are the original images which we take as input the image on the left is cancer image and on the right is mole

Fig 6. Mask Is created

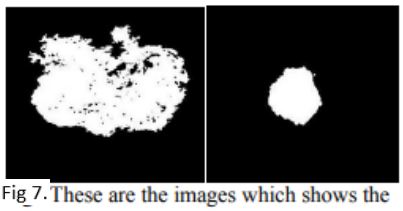

Fig 7.These are the images which shows the biggest blob detected in the input image.

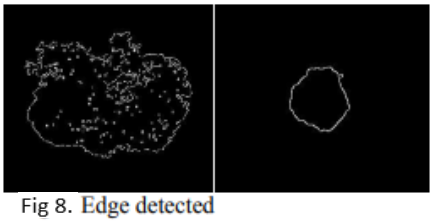

Fig 8. Edge detected

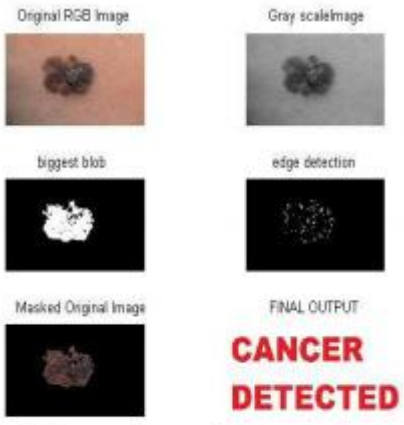

Fig 9. Cancer detected

Fig 10. Cancer not detected

VIII. Conclusion:

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Hence this paper briefly summarizes the methods that deal with the non-invasive approach for the detection of the skin cancer. We studied about the use of dermoscopy in dermo sensor [14]. However, every machine has advantages and disadvantages. It can be concluded using dermoscopy can be beneficial in a lot of ways and as the science develops more and more the use of dermoscopy will become more and more, for now there are limited countries using dermoscopy to fullest but in near future there is high possibility of the increase demand of dermoscopy. It can also conclude that it can used at places where there is few or less specialised dermatologist and surely can provide a large impact in medical field.

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