IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

PRE-DIAGNOSIS OF SKIN CANCER USING IMAGE PROCESSING

[1]Mithilesh.B,
[1]Student,
[1]Biomedical Engineer,
[1]Rajiv Gandhi College of Engineering and Technology, Pondicherry, India.

Abstract- The use of photos from a standard camera to automatically identify melanoma that are malignant is a revolutionary technique. As a pre-screening system for the early diagnosis, this type of automated system would be very beneficial to dermatologists. A significant lot of research has been done in this field on dermoscopy images, but little focus has been placed on creating an expert system for diagnosis utilising photos from conventional cameras. Also taking into account the possibility that dermoscopy may not be readily available to the general public, this work focuses primarily on applying the algorithm to photos captured by a camera. The suggested approach utilises pre-processed pictures that have undergone lesion segmentation and feature extraction. To identify variation in the photos, morphological traits such as asymmetry, border irregularity, and colour variation are extracted. Consequently, skin cancer can be identified and the dangers connected with it can be somewhat diminished.

Keywords*:* melanoma, skin disorderss, malignant, segmentation, feature extraction, color variation.

I. INTRODUCTION

A. Human Skin

Human skin is the covering or integument of the body's surface that provides assurance and receives tactile improvements from the outside environment. It is the largest organ of the integumentary framework and the body's outermost layer. Up to seven layers of ectodermal tissue in the skin cover internal organs, muscles, bones, and tendons. The majority of other highly evolved species' skin is practically the same as that of pigging. The distinguishing characteristics of the skin change from birth to old age. When it comes to infants and young children, it is often smooth, dry, delicate, and free of kinks and flaws. Children under the age of two rarely sweat enough, and when they do, it's not enough, and their sebaceous glands scarcely work at all. Especially on the male face, pubic area, axillae, and scalp, hair develops during infancy and becomes longer, thicker, and more pigmented. Skin inflammatory injuries usually develop, the overall pigmentation of the skin increases, and localised pigmented foci manifest abnormally. Sebaceous production, sweating, and hair growth all begin to flourish. Age-related physical and physiological changes, as well as exposure to sunlight and wind, cause skin, especially that not covered by clothing, to become dry, wrinkly, and limp. Veins are abundantly present throughout the human body, invading the skin in a tangled but clearly effective mass of conduits, veins, and vessels. The fact that there is so much blood present—far more than what the skin actually needs to function biologically—is evidence that the blood vascular system is helping the skin function as a cooling device. Sweat glands release water onto the skin's surface to aid in this function, and when it evaporates, the water absorbs heat from the skin. When it's chilly outside and it's important to keep an eye on body heat, cutaneous veins constrict quickly and repeatedly, allowing only a small amount of blood to pass through them. When the weather is warm, they contract across extended distances, allowing blood to

flow freely. Blood moves through the skin at its fastest rate during intense effort, when tremendous amounts of heat generated should be removed.

B. Skin Cancer

Cancers that start in the skin are known as skin cancers. They result from the growth of aberrant cells that can infiltrate or disseminate to different areas of the body. Basal-cell skin cancer (BCC), squamous-cell skin cancer (SCC), and melanoma are the three main kinds of skin cancer. The most aggressive tumours are melanomas. A mole that has altered in size, form, or colour, has irregular edges, has several colours, itches, or bleeds are all warning signs. Skin cancers other than melanoma include BCC and SCC. A firm red nodule, a scaly growth that bleeds or forms a crust, or a sore that doesn't heal are all possible symptoms of non-melanoma skin cancer (NMSC). The different types of skin cancer or skin abnormalities are:

i). Basal cell carcinoma

The skin cells known as basal cells, which replace older cells at the base of the epidermis, are where basal cell cancer begins. Most often, this type of skin cancerous growth appears on the skin's outer layer. Basal cell carcinoma typically doesn't spread to other parts of the body. When it occurs, which is rare, it frequently undermines. According to the American Cancer Society (ACS), basal cell tumours account for about 80% of all skin cancerous growths. Of the three types of cancer mentioned in this thesis, BCC is the most prevalent. BCC is thought to be less lethal in terms of mortality since it has a very low propensity for metastasis (Ringborg & Lagerlöf, 1998). Although BCC was not recorded in the Swedish Cancer Registry until 2002, estimates show that there are roughly 25,000 occurrences on average per year (personal communication, Centre for Epidemiology, The National Board of Health and Welfare). Therefore, BCC causes a significant amount of morbidity. A pearly, semitransparent papule is a common description of BCC (Ringborg & Lagerlöf, 1998).

ii). Squamous cell cancer

The cells on the farthest section of the epidermis are affected by squamous cell disease. Squamous cells are also seen in tissues including the lungs and mucous membranes. The term "cutaneous squamous cell malignant growth" refers to the development of squamous cell disease in the skin. The portion of the body that is frequently exposed to bright (UV) sunlight is where this type of sickness is most frequently detected. Although it is a disorder that may be effectively treated, leaving it untreated can be dangerous. In terms of mortality, this kind of skin cancer is less deadly than malignant melanoma. In Sweden, non-melanoma skin cancer claims the lives of about 50 people each year (The National Board of Health and Welfare, 2002b). According to Ringborg and Lagerlöf (1998), SCC is frequently distinguished by a reddening, grittier alteration in the skin, occasionally with peeling skin. Rarely does SCC metastasize.

iii). Melanoma

Melanoma, which makes up about 1 percent of all skin malignant growths, is a different category of skin illness. These cancerous growths are produced by the same skin-tone-giving cells. Melanocytes are the name for these cells. Melanocytes shape non-cancerous moles, although they have the potential to becoming malignant. Anywhere in your body can support melanoma growth. In men, they are more prevalent on the chest and back, whereas in women, they are more prevalent on the legs. CMM is caused by a potentially dangerous alteration in the melanocyte, the skin's pigment-producing cell (Koh and Lew, 1995). Shallow spreading melanoma (SSM), nodular melanoma (NM), and lentigo malignant melanoma are the three main histogenetic subtypes of CMM (LMM). The most prevalent and most often increasing kind of skin cancer with a histogenetic basis is SSM (The National Board of Health and Welfare, 2001).

II. EXISTING SYSTEM- MOLE INVESTIGATOR: DETECTING CANCEROUS SKIN MOLES

A. Optional Advanced Imaging Techniques

A growing number of medical professionals are employing dermatoscopy in addition to a visual examination to make it easier to locate skin lesions. A polarised light source and a unique magnifying lens make up the dermatoscope, which enables a closer examination. Digital photographs of the areas are frequently taken by doctors as well. It has been demonstrated that an expert eye using a dermatoscope has higher accuracy than observation with the naked eye and better differential diagnosis.

MelaFind and Spectrophotometric Intracutaneous Analysis System (SIAscopy) are devices that emit radiations into the skin in the 400 to 950 nm range to provide a range of clinical and dermatoscope pictures in addition to dermatoscopy. Both methods calculate the quantity of light that is reflected at each wavelength, which is crucial to know since different skin components have different optical characteristics. They can react

selectively to particular wavelengths of light and can absorb or reflect light in variable amounts. SIAscopes use pattern-recognition algorithms to assess data on the location, amount, and distribution of melanin, collagen, and haemoglobin in the skin. The dermatologist is then shown this on a screen in the graphical format known as SIAgraphs. The SIAgraph for a melanoma patient has been created and is simple to recognise. SIAgraphs thus enable medical professionals with little training to spot melanoma in its early stages. In addition to producing graphs like SIAgraphs, MelaFind also examines these graphs to offer a fully automated diagnosis. But SIAscopes and MelaFind diagnosis frequently provide false positives, necessitating a biopsy to confirm the existence of melanoma. Our approach can be compared to SIAscopies and MelaFind as a pre-screening procedure. Since mobile phones are unable to emit light with various wavelengths, it will not be able to generate graphs that are comparable to SIAgraphs. However, it can lower the number of pointless SIAscopies and MelaFind testing and encourage those who do require them to get help sooner. A SIAscope examination costs $250 for the patient. Each MelaFind session costs $150 to $200 and the average cost is $7,500. MelaFind must be administered at a doctor's office.

B. Existing Mobile Applications

There are already a number of mobile phone applications available for the identification of skin cancer. Our application, however, is distinct from and outperforms others in a number of respects. Two of these applications are listed below. Users of the app SkinVision may submit pictures of their moles and use it to follow the development of those moles. Additionally, it aids users in understanding the signs and dangers of skin cancer. Our software provides additional diagnostic information and goes beyond simple tracking to inform users of their risk of developing skin cancer.

Immediately after a user uploads an image, Doctor Mole analyses it. According to the asymmetry, border, colour, diameter, and evolution criteria for evaluating moles, it analyses the image and provides numerical results for each criterion separately. The software uses a "freemium" business model and offers more thorough analysis to customers who pay for it. By offering a consolidated likelihood that captures and incorporates several factors that dermatologists examine, our tool outperforms Doctor Mole.

C. SYSTEM MODEL

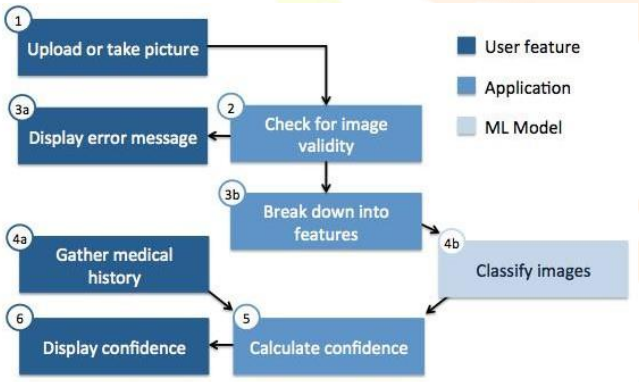

Figure 1: System block diagram

Our iOS software, Mole Investigator, enables users to snap images of their moles and check if they are melanoma-risk lesions. To assist users in tracking and analysing skin moles that may be melanoma risk factors, the application blends an easy and user-friendly UI with a potent machine-learning based backend. The user interface, picture validity checker, machine learning model, and user questionnaire make up its five main parts, as seen in Figure 1.

1) Mole Investigator, like many mobile applications, enables users to submit photos they've already taken and stored to their device's photo log as well as snap brand-new pictures of moles from within the programme. Mole Investigator is able to standardise picture processing and loading to our machine learning model for just JPEG files since iOS saves all photographs as JPEG files in the Photo Stream.

2) Validate the image: This is a crucial step in our application to ensure usability. What if a user unintentionally submitted a photo of their cat rather than a photo of their skin mole to our application? In the event that the user did make a mistake, the image validity function should be fast to return an error. The maximum amount of time a user should have to wait before seeing if their image passed our authenticity checks is three seconds. The original picture is re-displayed in the application's results page as a safeguard in the event that our validity checking does not function properly.

3a) The programme sends users back to the original landing page with an error notice shown at the top of the window if they do enter an incorrect page.3b) Separate into features: Our conversations with Drs. Jeremy Etzkorn and Emily Chou at the Perelman School of Medicine allowed us to determine the precise visual characteristics that medical professionals look for when pre-screening a patient's skin mole. The main characteristics that doctors look for are the asymmetry of the mole, the border of the mole, the colour of the mole in relation to the patient's natural skin colour and within the mole itself, whether the mole is enlarging over time, the amount of sun exposure the patient has had, and if the mole is noticeably different from other moles on the patient's body. There are many risk factors and visual indicators that doctors evaluate. Due to the absence of change over time in a static image, the fact that the amount of sun exposure is not evident in a mole, and the absence of other moles in the image, respectively, it is challenging to identify the latter three characteristics from a still image.

D. DRAWBACKS OF EXISTING SYSTEM

- It does not create any account in the user's name for privacy reasons.
- Accuracy is less compared with biopsy.
- It is a fact that these technologies being used as a real-time aid is of doubt unless and until further investigations on the technology is been done.

III. PROPOSED SYSTEM-PRE-DIAGNOSIS OF SKIN CANCER USING IMAGE PROCESSING

The project's goal is to decrease skin cancer-related deaths, which are on the rise globally. The biggest issue with this endeavour is melanoma. Early detection and treatment may nearly always cure melanoma, but if these steps are not taken, the disease may develop and spread to other regions of the body, where it will be difficult to treat and perhaps deadly. As a result, the project's impact is the early detection and decline in death. Although it may happen everywhere on the body, it often originates in skin that has been exposed to sunlight. The biopsy procedure is typically used to find skin cancer. The part of the tissue will be sent to the laboratory and it will undergo various tests to find whether it is cancer or not.

A. Data collection

Lesion images are acquired and processed in Python to enable lesion identification. Many photographs on the internet are used as examples of carcinogenic imagery. Additionally, patients visited hospitals to gather photographs from various collections linked to skin cancer. Students' body parts are examined for patches and moles, which are interpreted as benign growths.

B. Image Processing

The image processing steps are:

1. Image Acquisition: This is the first cycle or stage in the main advanced photo handling procedures. Giving a photograph that is already in advanced structure might be the most basic way to secure a picture. Generally speaking, the stage that secures the photo. Dermoscopic images—pictures acquired with a dermatoscope—contribute to the framework that has been developed. It functions as a kind of magnification for taking photos of skin lesions (body part). The hand-held tool makes analysing skin infections quite straightforward.

2. Pre-Processing: Objective of pre-handling is an improvement of picture information that diminishes undesirable mutilations and upgrades some picture highlights significant for additional picture handling. Picture pre-handling includes three most compelling things:

a) Gray scale conversion b) Noise removal c) Image enhancement.

a) Gray scale conversion: Only brightness information is included in a grayscale image. Each pixel's value in a grayscale image corresponds to a quantity or amount of light. In a grayscale image, the brightness graduation may be distinguished. Only light power is estimated in a grayscale image. The splendour range for 8-digit images ranges from 0 to 255, where 0 refers to darkness and 255 refers to whiteness. A shading-based image is converted into a grayscale image via grayscale change. Gray scale pictures are all the more simple what's more, more quickly to process than hued pictures.

All picture handling strategy are applied on grayscale picture. In our proposed framework shaded or RBG picture is changed over into grayscale picture by utilizing weighted total strategy by utilizing following conditions: Grayscale intensity= 0.299 R + 0.587 G + 0.114 B

b) Noise removal: Commotion evacuation aims to locate and remove unwanted noise from digital images. Determining which aspects of an image are real and which are the result of chaos is difficult. Pixel value irregularities are referred as as clamour. We are using middle channel in our suggested structure to reduce unwanted noise. Since the middle channel is nonlinear, its edges remain invariant. Middle channel is operated via an atypically sized sliding window. Each example, esteem is placed according to size, with the channel yield at the centre of the test inside the window.

c) Image enhancement: One of the simplest and most entertaining aspects of sophisticated photo processing is picture enhancement. The primary idea of upgrading methods is to draw attention to select highlights in a photograph that are of importance by bringing out darker detail. As an illustration, consider how brilliance and distinction are evolving. The purpose of picture enhancement is to work with a picture to increase the perceivability of an interest component. Here, contrast improvement is used to provide results of higher quality. Segmentation involves removing areas of interest from a given image. An area of interest that includes every equivalent pixel. For division, we are using highest entropy thresholding in this case. Above all else we need to take dim degree of unique picture then, at that point, ascertain histogram of dark scale picture then by utilizing most extreme entropy separate frontal area from foundation. After most extreme entropy we got paired picture that is highly contrasting picture.

3. Image Restoration: The field of photo reclamation also deals with enhancing a picture's presence. However, unlike upgrading, which is subjective, picture rebuilding is objective since reclamation techniques are frequently based on analytical or probabilistic models of picture damage.

4. Shading Image Processing: Due to the massive increase in the use of sophisticated photos on the Internet, the field of shading picture processing has been growing in importance. This might involve processing and displaying shades in a digital space, among other things.

5. Wavelets and Multiresolution Processing: The foundation for addressing images at various levels of objective is the wavelet. For information pressure and pyramidal depiction, images gradually move into smaller spaces.

6. Extraction of Features: Include extraction plays a big role in distinguishing the data that is contained in a particular image. Utilizing GLCM for surface picture analysis is a cutting-edge approach to detect spatial dependence between image pixels. To capture the majority of typical components, such as differentiation, mean, energy, and homogeneity, GLCM focuses on low-level image frameworks.

7. Pressure: Pressure manages methods for lessening the capacity expected to save a picture or the data transmission to send it. Especially in the purposes of web compacting data is a lot of important.

8. Morphological Processing:

Morphological handling manages instruments for extricating picture parts that are helpful in the portrayal and depiction of shape.

9. Division: Division strategies parcel a picture into its constituent parts or items. By and large, independent division is one of the most troublesome undertakings in advanced picture handling. A tough division strategy brings the interaction quite far toward fruitful arrangement of imaging issues that expect objects to be distinguished independently.

10. Portrayal and Description: The outcome of a division stage, which is often primitive pixel information and establishes either the boundary of a district or every location in the real region, is frequently followed by portrayal and representation. Selecting a representation is only crucial for the solution to transforming raw data into a structure appropriate for further PC treatment. When separating credits that result in quantitative data of relevance or are necessary to distinguish one class of articles from another, portrayal oversees the process.

11. Object acknowledgment: Acknowledgment is the interaction that allocates a name, for example, "vehicle" to an item founded on its descriptors.

12. Information Base: Information may be as simple as identifying areas of an image where the desired data is known to be present, which would limit the search that would need to be conducted to find that information. The data base can also be exceedingly confusing, such as a connected list of all key possible flaws in a materials review problem or a picture data set with high-resolution satellite images of a location for change-recognition applications.

C. STEPS

The flowchart says about two outputs i.e., skin cancer detection and skin cancer not detection. The steps are like:

1. Lesion will be read in the code.

2. The pixel rate of the cancer lesion will be already coded.

3. It finds the pixel rate of the loaded lesion. It will compare with the pixel rate of the cancerous image's pixel rate.

4. If the loaded image's colors' pixel rate comes in between cancerous one, then we can conclude that skin cancer is detected. Otherwise, it is non-cancerous image.

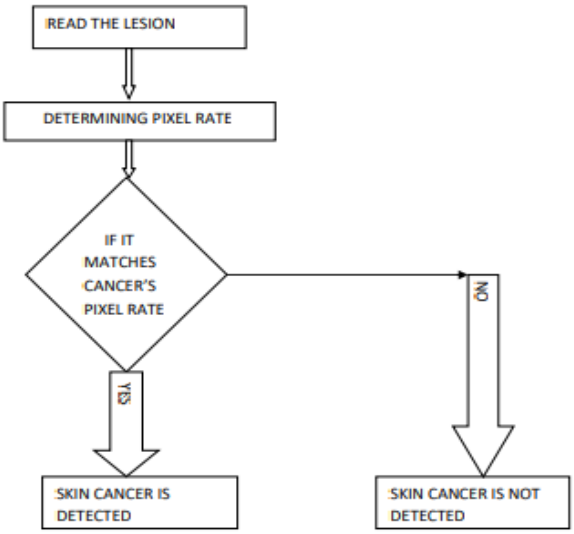

Figure 1.2 Flowchart of algorithm for skin cancer detection.

IV. RESULTS AND DISCUSSION

This project says about pre-screening where we can get 90 percent confirmation whether a patch or mole which seems to be cancerous is real or our assumption. Before visiting doctor, people can make sure whether their assumption is wrong or right to an extent. One of the main drawbacks in this case is that depending upon the skin tone, color changes in each person. The person who is fair in texture will be getting reddish in color and for those in dark texture will be getting brown in color in the case of melanoma. So, while capturing the image, depending upon the color of the other part apart from the lesion should be taken into account in order to take the project to a next level.

V. FUTURE WORKS

As of future works, the main thought goes to produce an instrument to foresee the likelihood of a censure mole. This detection system can also be made as a application which can be used in smart phones. It also has different application in online mode like:

Web App: The web application will have the likelihood that a client transfers a great picture of a particular mole. The outcomes will be a forecast about the likelihood that the given mole be insult as far as rate. The backend that contain the web application and model stacked will be situated in Amazon Web Administrations.

Iphone App: Our CNN model will be stacked into the iPhone to make nearby expectations.

• Benefits: The picture information doesn't should be transferred to any server, on the grounds that the model forecasts should be possible through the pre-prepared model stacked into the iPhone.

Android App: (Optional assuming time permit it)

In future we can expand the diagnostics of this model (not only limited to skin cancer but also other skin related problems) It can be produced as a marketable product. Based on the affordability everyone can use this device at home as a self-testing device for skin related issues.

REFERENCES

1 Fredrik Georgsson and Tor-BjörnHolmström, MasterThesis in Computing Science "A Survey and Evaluation of Features for Diagnosis of Malignant Melanoma" August 2005.

www.cancer.net/patient/Cancer+Types/Melanoma?sectionTitle=Statistics

2 Kittler et al.H. Kittler, K. Pehamberger, K. Wolf and M. Binder,"Diagnostic accuracy of dermoscopy, The Lancet Oncology3"2002, pp. 159– 165.

3 Pehamberger H, Binder M, Steiner A, Wolff K. "In vivo epiluminescence microscopy: improvement of early diagnosis of melanoma."J Invest Dermatol 1993,100:356S–62S.

4 Bafounta ML, Beauchet A, Aegerter P, Saiag P. "Is dermoscopy (epiluminescence microscopy) useful for the diagnosis of melanoma? Results of a meta-analysis using techniques adapted to the evaluation of diagnostic tests". Arch Dermatol 2001,137:1343–50.

5 McGovern TW, Litaker MS. Clinical predictors of malignant pigmented lesions"a comparison of the Glasgow seven-point checklist and the American Cancer Society's ABCDs of pigmented lesions" J DermatolSurgOncol 1992,18:22–6

6 Aitken, J. F., Elwood, J. M., Lowe, J. B., Firman, D. W., Balanda, K. P., & Ring, I. T. (2002).

7 A randomised trial of population screening for melanoma. - 0HG 6FUHHQ (1), 33-37.

8 Ajzen, I. (2002). Percieved behavioral control, self-efficacy, locus of control, and the theory of planned behaviour. - $SSO 6RF 3V\ FKRO (4), 665-683. [10]Amir, Z., Wright, A., Kernohan, E. E., & Hart, G. (2000). Attitudes, beliefs and behavior regarding the use of sunbeds amongst healthcare workers in Bradford. (XU - &DQFHU&DUH (2), 76-79.