



Early Detection and Analysis of Melanoma Skin Cancer using Image Processing Technique: An Analysis

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Abstract: Image Processing is improving day by day for detecting melanoma in early stage. Early stage is important to detect because it helps in curing and surviving. Image processing is easy and affordable for all. Our research proposed that Image process is better than Visual detection, gives more accuracy. It uses algorithm to detect and process the image and gives the detail information, helps in selection for the type of melanoma. The Image Detection System would run in some advanced and detection supported smartphones only, so that anyone can capture the image of the lesion with their smartphones and analysis by their own. This will bring a great impact in the future for detecting other types of skin diseases. Here we also proposed the Rule of ABCDE to help in identifying Melanoma. This Image processing Technique will evolve and improve further, until we got the 100% accuracy in detecting Melanoma

Index Terms - Melanoma, disease detection, deep learning, image processing

1. INTRODUCTION

Melanoma is the deadliest skin cancer, if it is not identified in an earlier stage it may cause death, only the skilled dermatologist can identify it by seeing whether it is melanoma or not. Almost 99,780 people in the US were diagnosed with Melanoma. In 2020, around 324,625 people were diagnosed. In research, the scientists found that Australia and New Zealand peoples suffer the highest rate of Melanoma and also possess the highest death rate in the world. There are mainly three types of skin cancer – basal cell carcinoma, squamous cell carcinoma, and melanoma. Melanoma is detected through image processing, like Dermoscopic images, mobile images, or smartphone images.

Day by day scientists is researching better methods to implement and find the cure for Melanoma. Dermoscopic image processing is a costly process and not all can effort this process. So, the scientists introduce a process called the mobile image detection process. In this process, they capture a digital image and pre-process it in the system which analyzes by the algorithm and detects that the person is suffering from Melanoma.

Due to a lack of awareness in people, it is difficult to detect Melanoma in earlier stages. It is important to identify melanoma in the early stage, and to diagnose it correctly for proper treatments and can be treated surgically. The Doctor removes the cancerous cell by surgery. Previously the Dermatologists use the ABCD sign, which means Asymmetry of the lesion, Border irregularity, Colour variation, and Diameter. But now they use ABCDE and here E stands for Evolving. These signs are used by dermatologists to detect Melanoma accurately, but sometimes it fails to detect by the naked eyes. ELM (Epiluminescence Microscopy) was used in earlier times to analyze the image visually. But to differentiate the type of melanoma cells and non-melanoma cells was not easy by naked eyes.

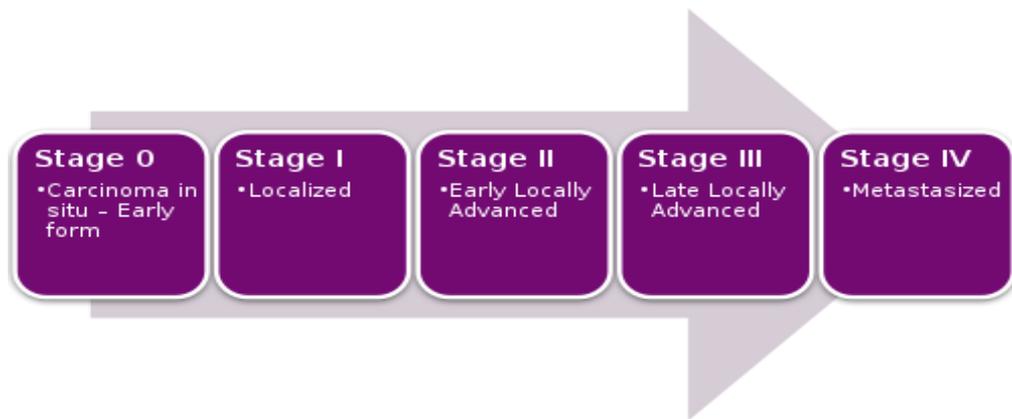


Fig. 1 Melanoma Stages

2. Reported State-of-Art to Detect Melanoma Skin Cancer

2.1. Biopsy Method:

In earlier times, a Biopsy test was also done to detect melanoma but it hurts a lot and takes a lot of time to identify, and is much more expensive. In this method, first, the doctor gives the local anesthesia to the infected area and the cancerous cell is cut and observed in the microscope.

2.2. Dermoscopy method:

In this method, Lesion images are clicked and analyzed under a dermoscopy microscope. This method brings the evaluation for treating Melanoma patients. Dermoscopy helps to differentiate between benign and malignant alteration.

2.3. Mobile Image Detection:

This is the process in which pictures of lesions are clicked by smartphones or digital cameras and processed in a system to detect that the person is suffering from Melanoma or non- Melanoma. It works on the algorithms and is detected automatically by combining lightweight methods. This method saves much more time than the other processes. In this process, the algorithm works in two parts – Wrapper and Filter. Wrapper evaluates all the goodness information. But the filter selects the required data and arranges it for giving full information about the image.



Figure 2 Picture clicked by smartphone of Melanoma infected skin

Nowadays scientists are seeking to develop AI technologies that can scan the affected cell and diagnose as fast as they can and acquire more knowledge on other types of Melanoma cancerous cells. Using the algorithms they have saved many lives and detected melanoma in the early stage.

3. Reported Literature

In [1], the author says there is an urgent need for an approachable and error-free pre-screening solution to refine the general awareness. Progressively, smartphones are now provided with multi-core CPUs and high-resolution image sensors. All this creates the chance to use a smartphone to scan and capture images for disease diagnosis and self-screening. Taking this chance, this research work can create a mobile imaging system for the early detection of melanoma [2]. The author Xu L. et al introduced a method in which he reduced the color image into an intensity image by an intensity threshold. He uses an elastic curved method to detect the accurate size of skin lesions. Earlier, Robert Amelard et al developed the Xu L. et al method, [3] which performs the illumination correction and using High-Level Intuitive Features (HLIF) he extracted the skin images. Later in 2013, N.S Ramteke et al [4] proposed a theory based on the ABCD rule which means Asymmetry of the lesion, Border irregularity, Colour variation, and Diameter. He used this method to detect cancerous cells. He also improved his method using wavelet transformation and further implemented this method for the diagnosis of cancer. A few years later, the author added [5] the 'E' factor and introduced the next level of diagnosis of Melanoma. A great impact and evolution came when the author introduced the 2D wavelet method, which differentiates between Malignant and Benign Melanoma skin cancer. But it can only detect the accuracy of 80% of the results.[6] The algorithms can be divided into two categories according to their evaluation criteria: wrapper and filter.[7] uses smartphones for incident light microscopy image analysis. It uses non-polarised light sources and magnifiers, under controlled clinical situations. It includes features below the skin surface, which cannot be captured with normal cameras provided in smartphones. In [8], a smartphone working for images taken from its camera is presented. But, to detect lesions, they used a very basic method. Lesions are reported as the only simple color features.

4. Future Scope

As the technological advancement is on great pace, Artificial intelligence has great potential in the detection of Melanoma. It will not only help in the early detection of Melanoma but also it will help in its treatments. However, the AI system for detection of Melanoma is still in a very early stage and just because the computer can read thousands of data it doesn't mean that they can read any image correctly, as everyone has a different phone, lighting condition, and background. Having said that, I do believe that Artificial intelligence has great potential in the detection of Melanoma and other skin diseases. It will be of great use and will provide a helping hand to all physicians in not only the detection of Melanoma but also in its treatment and cure.

5. Conclusion

All the techniques used for detecting Melanoma were quite good but the visual analysis method may fail in some cases. Only the highly skilled dermatologist can detect and sense the difference between Melanoma and non-melanoma cancerous cells. This method has no accuracy, charges lots of money, and takes lots of time to detect. Latest methods like Mobile image detection are developing better ways to save lives and are affordable for all. Using Artificial Intelligence, now detection of cancerous cells is easy. This method has brought a great impact on the world and easy treatment and helps in defining the types of Melanoma cancer. Some types of melanoma cancer like malignant melanoma are still unable to detect and take lots of time to cure.

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