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Comparison of Various Feature Sets for Skin Lesion Analysis

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Abstract-- Skin cancer is the most common type of cancer in the United States. Melanoma is the most life-threatening form of skin cancer. Each year, more than 68,000 Americans are diagnosed with melanoma, and another 48,000 are diagnosed with an early form of the disease that involves only the top layer of skin. Although advanced melanoma is often considered as incurable, if detected and excised early, the prognosis is promising. Today, clinician use Computer Vision in an increasing number of applications to aid early detection of melanoma through dermatological image analysis. Different methods are used now a day for the analysis of melanoma at the earlier stages. Analysis is mainly based on the various feature sets.

Such as Asymmetry, Border, Color, Diameter, Evolution, Texture, Shape etc...But for the detection of melanoma, combining all these features make the method more complex and also more time consuming. To avoid such problem here, these feature sets are compared based on their accuracy and finally find more accurate and time consuming method.

Keywords:-Skin Cancer , Melanoma , Computer vision , Feature sets.

I. INTRODUCTION

Melanoma is a malignant tumor of melanocyte cells. The melanocytes produce a protein called melanin which protects the skin by absorbing ultraviolet (UV) radiation. Melanin is a biological pigment and the primary colorant of the human skin. Although less common than other skin cancers, melanoma is the most serious type because of its rapid proliferation and potential to metastasize. If not detected early, melanoma can be very dangerous and life threatening. Melanoma's main invasive characteristic is vertical penetration through the skin. As it invades, it may progress beyond the site of origin and spread through the body. When melanoma invades and compromises the function of a vital organ, it causes death. Thus, early diagnosis is paramount, as delays or missed diagnosis increases mortality. Unfortunately, melanoma is often ignored until too late because, in the early stages, it may look harmless and cause no discomfort.

The diagnosis of melanoma involves two steps that is first one is identification of a suspected melanoma and then histological confirmation at pathology carried out after the lesion was surgically removed (excision biopsy). The first step is primarily based on visual examination.[1] Different methods are used now a day for the analysis of melanoma at the earlier stages. Analysis is mainly based on the various feature sets Such as Asymmetry, Border, Color, Diameter, Evolution, Texture, Shape etc...But for the detection of melanoma, combining all these features make the method more complex and also more time consuming. To avoid such problem here, these feature sets are compared based on their accuracy and finally find more accurate and time consuming method.

The notwithstanding, researchers have established that there are numerous methods that are used to diagnose melanoma. Some of the remarkable methods include Seven Point Checklist, CASH (color, architecture, symmetry, and homogeneity) and ABCDE (Asymmetry, Border, Color, Diameter, Evolving) methods. At this juncture, the most important point of concern is the various strategies that are used to diagnose melanoma. There have been controversies on the use of naked eye and computer-aided technology in analyzing the symptoms of melanoma. A group of researchers have realized that the method of naked eye is widely used by less experienced clinicians. Contrastingly, evidences have shown that clinicians who are experienced prefer using computer aided technology in order to obtain fine images that help in diagnosing melanoma. Therefore, there are quite a number of researchers who support use of computerized technology such as ceroscopy images in order to boost effectiveness of diagnoses and prevention of melanoma. It is against this backdrop that this research aims to address the issue of early diagnosis and prevention of melanoma using ceroscopy images.

For 30 years, more or less, melanoma rates have been increasing steadily. It is 20 times more common for white people to have Melanoma than in Africans. Overall, during the lifetime, the risk of getting melanoma is approximately 2% (1 in 50) for whites, 0.1% (1 in 1,000) for blacks, and 0.5% (1 in 200) for Hispanics.[2]

II. RELATED WORKS

Malignant Melanoma has been proved to be a deadly skin cancer that is more prevalent to people between the age of 15 years and above.[2] The diagnosis of melanoma involves two steps: identification of a suspected melanoma and histological confirmation at pathology carried out after the lesion was surgically removed (excision biopsy).[1] Dermoscopy image analysis is traditionally performed visually and qualitatively. A significant research effort is devoted to develop computational methods and algorithms to perform this analysis in an automatic and quantitative fashion . The potential diagnostic utility of automatic dermoscopy image analysis is many. For example, such a system can provide experts with an objective second opinion. It is possible for a computer system to recognise features not detected by a human expert, and therefore improve the diagnostic accuracy . It can be a powerful tool in patient care locations where experts are not available. It may also help patients to self check and bring malignant lesions to the attention of a health care provider. On the other hand, the difficulties involved are also abundant. For instance, in addition to legal challenges to gaining approval, for a computer-based diagnosis system to be widely accepted and applied much higher accuracy is required. Also, the diagnosis made by a computer system needs to be accompanied by explanation of sufficient quality to merit the clinicians' trust and respect. The latter is a challenge since what is known about human diagnostic processes, to begin with, is subjective, limited and controversial. For these reasons, automatic dermoscopy image analysis (especially aimed at early diagnosis of melanoma) is an open research area with increasing demand for novel contributions to facilitate accurate and reliable diagnosis systems. The research reported in this thesis is an attempt towards that goal.

Reda Kasmiv et al introduced implementation of automatic ABCD rule base melanoma detection .Their system uses features such as Asymmetry, Border, Color, Dermoscopic structures for the detection of melanoma. Pre-processing enables automatic detection of hair using Gabor filters and lesion boundaries using geodesic active contours. Algorithms are implemented to extract the characteristics of ABCD attributes. But it is less accurate and more time consuming.[3]
Margarida Ruela et al [4] propose role of shape in the detection of melanomas The contribution of shape-related features was assessed by developing a Computer-Aided Diagnosis (CAD) system whose classification is solely based on this type of features. Four shape descriptors were used, first separately and then simultaneously, to describe the images. Image segmentation was performed both manually, by an expert, and automatically, by using an Adaptive Thresholding algorithm SE = 92% and SP = 78%.

Dah-Jye Lee et al proposed a simple, fast, and accurate shape analysis method using Turn Angle Cross-correlation is developed for shrimp quality evaluation.[5].Jorge S. Marques et al [6] introduces the role of texture and color in the classification of dermoscopy images. It is based on features which can be easily implemented and tested by other researchers. It is concluded that both types of features achieve good detection scores when used alone. The best results (SE=94.1%, SP=77.4%) are achieved by combining them both.

Tarun Wadhawan et al [7] proposed Detection of blue whitish veil in melanoma using color descriptors. It is a novel algorithm for detecting the socalled blue-whitish veil color feature. Results show that when the blue-whitish veil is combined with the regression feature can provide sensitivity and specificity of 95.64% and 72.30%, respectively. Therefore detecting blue-whitish veil accurately is of paramount importance in systems for automated detection of melanoma.

Rebecca Moussa et al [8] proposed Computer-aided Detection of Melanoma Using Geometric Features. K-Nearest Neighbors (k-NN) machine learning algorithm is used to classify 15 lesions based on their ABD features.

III. DIFFERENT FEATURE SETS

- *Asymmetry:* If a line is drawn through this mole. the two halves will be different.
- *Border:* For an early melanoma, borders tend to be irregular with scalloped or notched edges.
- *Color:* Occurrence of different colors is another warning signal for malignant melanoma. Different shades of brown and tan or black could appear.
- *Diameter:* Malignant Melanomas are larger in diameter (1/4 inch or 6 mm), but occurs smaller when detected in initial phase.
- *Evolving:* Change in size, shape, color, elevation, or another trait, or any new symptoms like bleeding, itching or crusting.
- *Shape:* Shape is Avery powerful feature. Object may be identified from its outline.
- *Texture:* Set of metrics calculated in image processing designed to quantify the perceived texture of an image. Image texture gives us information about the spatial arrangement of color or intensities in an image or selected region of an image.

FEATURE	ACCURACY
ABCD[3]	91.25
ABD[8]	89%
COLOR AND TEXTURE[6]	94.1%
COLOR[7]	95.64%
SHAPE[4]	92%

Fig 1. Comparison of Different Features

IV. CONCLUSION

For the detection of melanoma skin cancer , a proper feature set is needed in these paper a comparative study of different feature set is explained. Regarding these comparison it comes into the solution that by combining the features color and shape ,a more accurate and time consuming and also less complex algorithm must be obtained for the detection of melanoma skin cancer.

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