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A Hybrid System for Skin Cancer Detection

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During the last decades, the incidence rate of cutaneous malignant melanoma, a type of skin cancer developing from melanocytic skin lesions, has risen to alarmingly high levels. The need for a computer-aided diagnosis of skin lesions is obvious and urgent. In this thesis, image processing techniques were used at first so as to automatically remove artifacts from dermoscopic image. The segmentation of skin lesions is an early crucial step in the process of automatically diagnosing system. the skin lesion is separated from the healthy skin according to the nature of dermoscopic images distributions, three segmentation methods are used to extract lesion region. Firstly, active contours were used for bell distribution shape. Secondly segmentation was done by ant colony optimization when automatically detected U-distribution. the third strategy applies adaptive threshold for two J-shapes. These three strategies provide better accuracy compared with using adaptive threshold segmentation only.

For the classification stage three systems are presented beside their comparison with using different color features. The first system uses Gray Level Co-occurrence Matrices (GLCMs) and selects twelve global features utilizes a fuzzy set. On the contrary, the second system does regard local color histogram and images represented based on bag-of-feature model. Therefore, in this system, lesions are divided into several patches. The best performance of this system is (*Sensitivity* = 100% and *Specificity* = 95%) when the images are represented in the opponent color space, patch size=16×16, bins=128 and 10 k-means cluster.

Lastly, first medical procedure of the ABCD rule of the whole image(Asymmetric) is combined with the two previous systems. By distributing this global feature into all patches and append with color local feature the best result is obtained. The best performance of this system is higher than the two previous systems(*Sensitivity* = 100% and *Specificity* = 97 .5%), that is achieved by RGB color representation using cityblock distance of the kNN classifier and same parameters mentioned above.

The dermoscopic images were obtained at the Dermatology Service of Hospital Pedro Hispano (Matosinhos, Portugal). The dermoscopic images have been divided into two independent sets; training set and test set. The training set consists of 70 images, and the test set consists of 50 images.

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