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Quantification of Skin Lesions by Adaptive Segmentation of Dermatoscopic Images

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ABSTRACT:.Image segmentation is an important task in analysing dermoscopy images as the extraction of the borders of skin lesions provides important clues for accurate diagnosis. One of the image segmentation algorithms is based on the idea of clustering pixels with similar characteristics. Fuzzy c-means (FCM) to work well for clustering based segmentation, however due to its iterative nature it has excessive computational requirements.An adaptive segmentation method computes the weights for the neighbourhood of each pixel in the image. It can not only overcome the effect of the noise, but also prevent the edge from blurring. To address intensity inhomogeneity, this algorithm uses the global intensity in the sequence and combines the local and global intensity information to ensure the smoothness of the derived optimal bias field and improve the accuracy of the segmentation. Application of this algorithm has yielded a correct segmentation ratio of more than 0.5.

KEYWORDS:.Fuzzy c-means (FCM),Clustering,Segmentation,Adaptive Algorithm.

I.INTRODUCTION

The skin is the largest organ of the body. It provides protection against heat, sunlight, injury and infection. Skin also helps in controlling body temperature and stores water, fat and vitamin D. Maligant Melanoma form of skin cancer[1], is one of the most rapidly increasing cancers in the world.Measurement of image features for diagnosis of the skin cancer requires the detection of lesions and localization in an image. It is essential to determine the lesion boundaries accurately so that measurements such as maximum diameter, irregularity of the boundary, and colour characteristics can be accurately computed. Dermatoscopy (also known as dermoscopy or epiluminescence microscopy) is the examination of skin lesions with a dermatoscope. This traditionally consists of a magnifier (typically × 10), a non-polarised light source, a transparent plate and a liquid medium between the instrument and the skin, and allows inspection of skin lesions unobstructed by skin surface reflections. Modern dermatoscopes dispense with the use of liquid medium and instead use polarised light to cancel out skin surface reflections. When the images or video clips are digitally captured or processed, the instrument is referred to as a "Digitalepiluminescencedermatoscope". This instrument is useful to dermatologists in distinguishing benign from malignant (cancerous) lesions, especially in the diagnosis of melanoma.

Fig.1: Dermatoscope

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Image segmentation helps us analyse dermatoscopic images as border of skin lesions get highlighted. Conventionally Fuzzy c-means (FCM) is employed for such purpose. However ,it has excessive computational requirements. Hongbao Cao [17] has developed Adaptive fuzzy c-means algorithm for segmentation of multiflex fluorescence in situ hyberdization (M-FISH) images and shown improved classification of chromosomes. This approach has been used for dermatoscopic images for achieving higher segmentation ratio . The development is briefly described in this paper.

II. ADAPTIVE FCM ALGORITHM

The image is first corrected to remove intensity inhomogeneity. This correction is then followed by a standard segmentation algorithm that assumes absence of inhomogeneity . An adaptive fuzzy c-means algorithm has been then used for segmentation and classification.

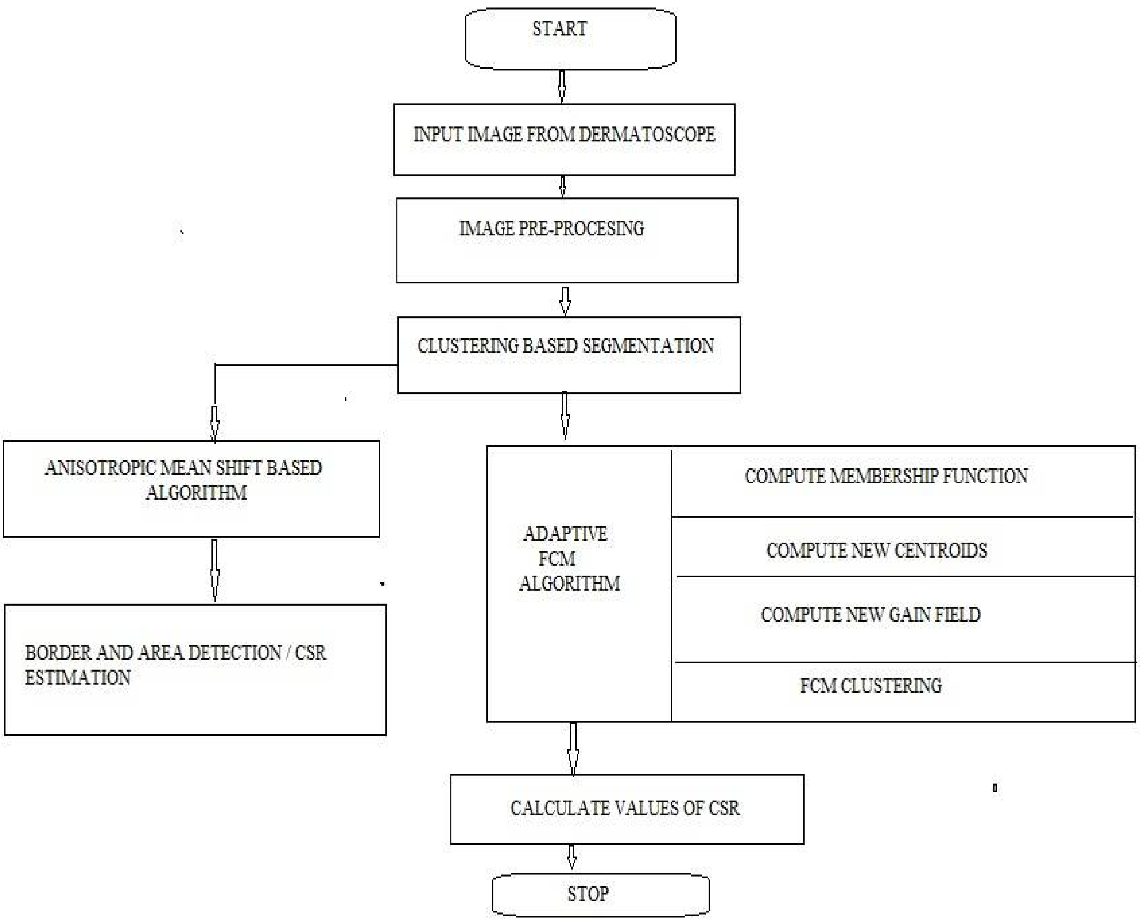

Fig.2: Flowchart for the Adaptive FCM algorithm

Fig 2. Shows flowchart for the Adaptive FCM algorithm used in this work. Input images from dermatoscope is prepressed by median filtering for removing hair, noise and unwanted artifacts . It is then segmented using invented approach and correct segmentation ratio is obtained. The pre-processed image then segmented using AFCM. Membership function,new centroids , new gain field etc are computed using equations described Hongbao Cao[17]. The final image is then preprocessed for CSR estimation.

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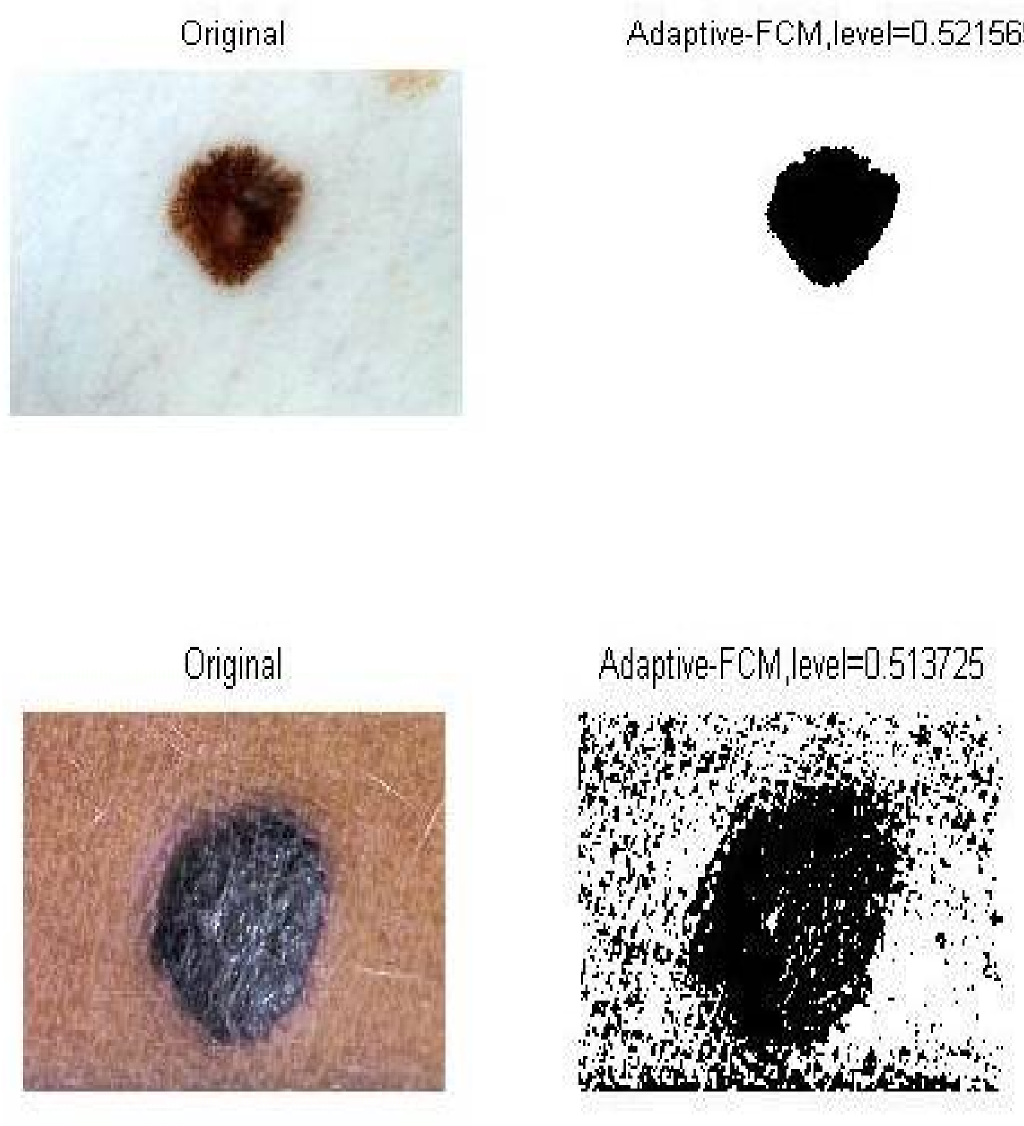

Fig.3: Pre-segmented and AFCM segmented images of two lesions, left side is original image ; right side is AFCM segmented image.

III. RESULT AND DISCUSSION

Fig.3 shows segmentation of dermoscopy images by the use of AFCM followed the steps, The performance of the segmentation is evaluated with the correct segmented rate (CSR), which is as follows:

$$CSR = \frac{\text{pixels correctly segmented}}{\text{total pixels}} \ldots \quad (4)$$

Images	CDR values by Anisotropic algorithm	CDR values By AFCM
Image 1	0.484314	0.521569
Image 2	0.390196	0.560784
Image 3	0.381857	0.513725
Image 4	0.410417	0.545098
Image 5	0.358824	0.521569
Image 6	0.523529	0.654902
Image 7	0.374510	0.501961
Image 8	0.421569	0.568627
Image 9	0.472549	0.6 39216
Image 10	0.4333	0.582353
Image 11	0.398039	0.584314
Image 12	0.437255	0.592609

Table I

Table I gives the CSR values of corrected segmentation of AFCM and Anisotropic algorithm for 12 dermatoscopic images. As can be seen from the table the CSR implies from 0.358824 to 0.59.

IV. CONCLUSION

The fuzzy segmentation of dermoscopic images that have been corrupted by intensity inhomogeneity and noise. We have use adaptive method to compute the weights for the neighbourhood of each pixel in the image. This adaptive method not only overcome the effect of the noise but also prevent the edge from blurring. Method converges iterations within 20 seconds in comparison to FCM which consumed minutes. The CSR shows segmentation improve from 0.358824 to 0.59.

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