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A DEFORMABLE MODEL TO SEGMENT SKIN LESIONS ON DERMOSCOPIC IMAGES

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Dermoscopy is an imaging technique widely used in the diagnosis of skin lesions, especially for the melonoma. Though its effectiveness has been proven in many studies, the diagnostic accuracy of dermoscopy largely depends on the examiner's experience. Computer-aided diagnosis (CAD) techniques have been proposed to solve this problem; the common procedure of these techniques is composed of three main steps: image segmentation, feature extraction, and classification. As the last two steps are quantitative analysis based on the boundaries of skin lesions, the accuracy of segmentation is critical for the whole CAD system. Nevertheless, the appearance of skin lesions varies considerably among individuals and in different skin conditions. Meanwhile, the boundary of the skin lesion is usually hard to be clearly defined due to the influences of hairs, skin texture, and air bubbles. As a result, segmentation on dermoscopic images is very challenging and forms the major obstacle for a fully automatic analysis system.

Deformable models are effective segmentation techniques that have been applied to many areas of image processing. In the segmentation of dermoscopic images, deformable models are less sensitive to the influence of noise and can represent the boundary of the skin lesion as a closed smooth contour. Besides, the implicit embedding using the level set functions efficiently represent the boundary and the corresponding region simultaneously, which is quite desirable for the later analysis by means of the shape and colour information of the skin lesions. In this study, a new geometric deformable model is proposed to fulfil the segmentation task. Following the statistical features of dermoscopic images in different colour spaces, the contrasts of the lightness and saturation between the lesions and the surrounding skins are used as the clues for segmentation; the two channels are combined to generate region-based external forces, following which the initial contour can contract to the boundary of skin lesion in a robust way. CUDA implementation of the proposed algorithm was adopted in order to improve the computational efficiency.

An open image database of skin lesions - PH2 database was used to test the effectiveness of the proposed algorithm and to compare the performances of different algorithms. Based on these experiments, the functions of parameters in the proposed algorithm are illustrated; the reliability of the algorithm and the automaticity of the segmentation on dermoscopic images

are discussed.

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