

ORIGINAL ARTICLE

Proposing a novel unsupervised stack ensemble of deep and conventional image segmentation (SEDCIS) method for localizing vitiligo lesions in skin images

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Abstract

Background: Vitiligo is an acquired pigmentary skin disorder characterized by depigmented macules and patches which brings many challenges for the patients suffering from. For vitiligo severity assessment, several scoring methods have been proposed based on morphometry and colorimetry. But, all methods suffer from much inter- and intra-observer variations for estimating the depigmented area. For all mentioned assessment methods of vitiligo disorder, accurate segmentation of the skin images for lesion detection and localization is required. The image segmentation for localizing vitiligo skin lesions has many challenges because of illumination variation, different shapes and sizes of vitiligo lesions, vague lesion boundaries and skin hairs and vignette effects. The manual image segmentation is a tedious and time-consuming task. Therefore, using automatic image segmentation methods for lesion detection is necessarily required.

Materials and methods: In this study, a novel unsupervised stack ensemble of deep and conventional image segmentation (SEDCIS) methods is proposed for localizing vitiligo lesions in skin images. Unsupervised segmentation methods do not require prior manual segmentation of vitiligo lesions which is a tedious and time-consuming task with intra- and inter-observer variations.

Results: Our collected dataset includes 877 images taken from 21 patients with the resolution of 5760*3840 pixels suffering from vitiligo disorder. Experimental results show that SEDCIS outperforms the compared methods with accuracy of 97%, sensitivity of 98%, specificity of 96%, area overlapping of 94%, and Dice index of 97%.

Conclusion: The proposed method can segment vitiligo lesions with highly reasonable performance and can be used for assessing the vitiligo lesion surface.

KEYWORDS

depigmentation disorder, image segmentation, skin lesion localization, stacked ensemble method