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A Novel Shape Constrained Feature-based Active Contour Model for Lips/Mouth Segmentation in the Wild

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Abstract

In this paper, we propose a novel joint formulation of feature-based active contour (FAC) and prior shape constraints (CS) for lips/mouth segmentation in the wild. Our proposed SC-FAC model is able to robustly segment the lips/mouth that belongs to a given mouth shape space while minimizing the energy functional. The shape space is defined by a 2D Modified Active Shape Model (MASM) whereas the active contour model is based on the Chan-Vese functional. Our SC-FAC energy functional is able to overcome the drawback of noise while minimizing the fitting forces under the shape constraints. We conducted our experiments on images captured under challenging conditions such as varying illumination, low contrast, facial expression, low resolution, blurring, wearing beard/moustache and cosmetic affection from the MBGC, VidTIMIT, JAFFE, and LFW databases. The results from our studies indicate that the proposed SC-FAC model is reliable and accurately perform prior shape weak object segmentation. The average performance of the mouth segmentation using proposed SC-FAC on 1,918 images from the MBGC database under different illuminations, expressions, and complex background reaches to a Precision of 91.30%, a Recall of 91.32% and an F-measure of 90.62%.

Keywords: Prior Shape, Level Set, Inner Shape Matching, Feature Subspace, Lips/Mouth Segmentation.

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