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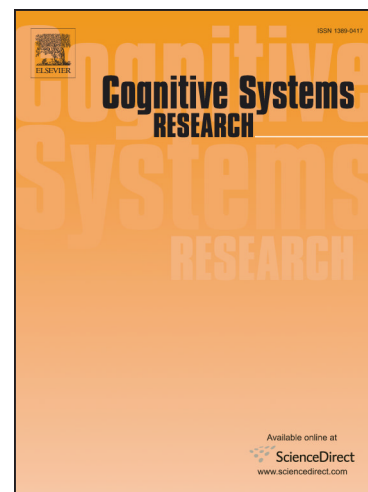
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Wild Facial Expression Recognition Based on Incremental Active Learning

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Abstract

Facial expression recognition in a wild situation is a challenging problem in computer vision research due to different circumstances, such as pose dissimilarity, age, lighting conditions, occlusions, etc. Numerous methods, such as point tracking, piecewise affine transformation, compact Euclidean space, modified local directional pattern, and dictionary-based component separation have been applied to solve this problem. In this paper, we have proposed a deep learning-based automatic wild facial expression recognition system where we have implemented an incremental active learning framework using the VGG16 model developed by the Visual Geometry Group. We have gathered a large amount of unlabeled facial expression data from Intelligent Technology Lab (ITLab) members at Inha University, Republic of Korea, to train our incremental active learning framework. We have collected these data under five different lighting conditions: good lighting, average lighting, close to the camera, far from the camera, and natural lighting and with seven facial expressions: happy, disgusted, sad, angry, surprised, fear, and neutral. Our facial recognition framework has been adapted from a multi-task cascaded convolutional network detector. Repeating the entire process helps obtain better performance. Our experimental results have demonstrated that incremental active learning improves the starting baseline accuracy from 63% to average 88% on ITLab dataset on wild environment. We also present extensive results on face expression benchmark such as Extended Cohn-Kanade Dataset, as well as ITLab face dataset captured in wild environment and obtained better performance than state-of-the-art approaches.

Keywords: expression recognition; emotion classification; face detection; convolutional neural network; active learning .

1. Introduction

Facial expressions are a form of nonverbal communication for social interactions. These days, the self-portrait photograph (called a selfie) is used on many different social networking websites where

images are captured in uncontrolled situations due to the availability of cheaper digital cameras and smartphones. Many of these images contain different facial expressions, such as happiness, sadness, disgust, anger, fear, and surprise. In our daily conversations, 55 percent of our feelings are expressed nonverbally or in a facial expression (Mehrabian, 1968; Ekman, 1993; ZHANG,

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