iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 Issue: VIII Month of publication: August 2016

DOI:

Volume 4 Issue VIII, August 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Detection of Smiling and Opening Eyes

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Abstract – In this paper, an efficient smile detection approach and open eyes rate is proposed based on Extreme Learning Machine (ELM). So in this open eyes and smiling detector is used LBP algorithm for finding key points in the images. Three catigories of face recognition such as Geometric-based approache, Appearance-based approache and Hybrid-based approache are defined. The basic seven facial expressions anger, disgust, fear, happiness, neutral,sadness and surprise are investigated.
Keywords – face recognition, , smile recognition, extreme learning machine, LBP, geometric-based, appearance-based and hybrid-based.

I. INTRODUCTION

In extreme learning machines where the weights connecting inputs to hidden nodes are randomly assigned. This nodes are no updated and these weights learning a linear model. The name "extreme learning machine" (ELM) was given to such models by Guang-Bin Huang [1]. Facial expression, controlled by a complex mesh of nerves and muscles beneath the face skin, enables people to convey emotions and perform nonverbal communications. Accurate recognition of facial expression is essential in many fields, including human-machine interaction, affective computing, robotics, computer games and psychology studies. There are seven basic facial expressions that reflect distinctive psychological activities: anger, disgust, fear, happiness, neutral, sadness and surprise[2]. This paper focuses on the recognition of two major facial expressions: detection opening eyes and smiling. The contribution of the paper is two-fold. First, we propose a method to address localisation error in existing face detection methods. After preliminary face detection, our method applies eye detection, a geometric face model and template-based face verification to precisely locate the face and correct rotation (in plane and some out-of-plane rotation). Second, we propose a novel neural architecture for image pattern classification, which consists of fixed and adaptive nonlinear 2-D filters in a hierarchical structure. The fixed filters are used to extract primitive features such as edges, whereas the adaptive filters are trained to extract more complex facial features.

II. RELATED WORK

Smile and open eyes detection is a personal task in facial expression analysis with applications such as photo selection, user experience analysis, and face recognition. As one of the most important and informative expressions, smile conveys the underlying emotion status such as joy, happiness, and satisfaction.
Face recognition techniques use three categories: geometric-based, appearance-based and hybrid-based.

A. Geometric-based approaches

A face image is represented geometrically via fiducial points or the shape of facial regions.Classification is done by analyzing the distances between the fiducial points and the relative sizes of the facial components. This proposed a method for detecting facial actions by analyzing the contours of facial components, including the eyes and the mouth. A multi-detector technique is used to spatially sample the contours and detect all facial features.

B. Appearance-based approaches

It processes the entire image by applying a set of filters to extract facial features. In this method is used Gabor wavelets to represent appearance changes as a set of multi-scale and multi-orientation coefficients. They proposed a ratio-image based feature that is independent of the face albedos. Their method can cope with different people and illumination conditions. In our detector is used Local Binary Patterns (LBP) to extract facial texture features and combined different local histograms to recover the shape of the face.

C. Hybrid-based approaches

Facial expression recognition can be improved by combining appearance and geometric features. More researchers proposed a multi-feature technique that is based on the detection of facial points and edges in the forehead area.

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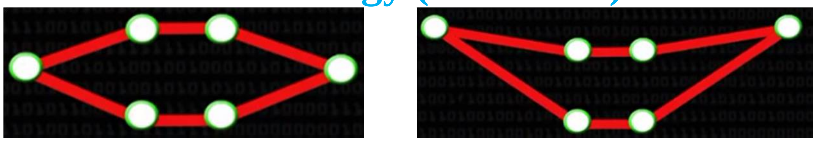

Fig. 1. Neutral and smiling view

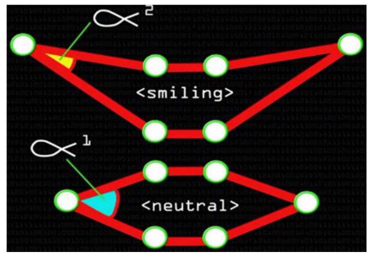

Fig. 2. Determine two corners α_1 and α_2, $\alpha_1 > \alpha_2$

$$D = \frac{1}{2}\sqrt{(m_{2x} - m_{1x})^2 + (m_{2y} - m_{1y})^2}$$

$$p_{1x} = \frac{3m_{1x} - m_{2x}}{2}, \quad p_{1y} = \frac{3m_{1y} - m_{2y}}{2}$$

$$p_{2x} = \frac{3m_{2x} - m_{1x}}{2}, \quad p_{2y} = \frac{3m_{2y} - m_{1y}}{2}$$

Here, based on the two mouse corner points m1 and m2, the four corners of the face region are determined as above. D - half distance between the two points m1 and m2. p1 and p2 - boundary points along the mouse line so, we can compute corner's point of the face as a:

$$r_{1x} = p_{1x} + Dsin\alpha \;\; r_{1y} = p_{1y} + Dsin\alpha, \qquad r_{2x} = p_{1x} - 3Dsin\alpha \;\; r_{2y} = p_{1y} + 3Dsin\alpha$$

$$r_{3x} = p_{2x} - 3Dsin\alpha \;\; r_{3y} = p_{2y} + 3Dsin\alpha, \quad r_{4x} = p_{2x} + Dsin\alpha \;\; r_{2y} = p_{2y} - Dsin\alpha$$

We can compute with two ways: mouth and eyes corners, compare boundary with eyes and mouth center (figure 2). We analysed the performance of the proposed method on the our standard database, which is commonly used in research on facial expression recognition. This database consists of more than 1000 images from 4 groups students. They were instructed to produce seven types of facial expressions. For each person, nine to eleven images were recorded for each facial expression. We applied the 10-fold cross validation on the smile and neutral expressions of the database. All images were divided into ten groups. For each validation fold, nine groups were used to train the classifier while the remaining group was used for testing. This step was repeated 10 times, and the classification rates of the ten folds were averaged to form the final estimate of the classification rate. The proposed system uses an input image size of 92 × 112 pixels. Experiments were conducted to determine the suitable values for different parameters.

III. CONCLUSION

We presented an approach for automatic detecting of smiling and open eyes. In our approach, eye detection and face alignment are used to correct localisation errors in the existing face detectors. The classification between smiling and neutral faces is done via a novel neural architecture that combines fixed, directional filters and adaptive filters in cascade. Our results is shown in the figure 3 at the solution under face.

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