Fuzzy linear projection on combined multi-feature characterisation vectors for facial expression recognition enhancement

Mohammed Saaidia*

Department of Electrical Engineering,
University of Souk-Ahras, Route de Annaba,
BP 1553 Souk-Ahras 41000, Algeria
Email: mohamed.saaidia@univ-soukahras.dz
*Corresponding author

Narima Zermi and Messaoud Ramdani

Department of Electronics,
Faculty of Engineering,
Badji Mokhtar-Annaba University,
P.O. Box 12, 23000, Annaba, Algeria
Email: narima.naili@univ-annaba.dz
Email: messaoud.ramdani@univ-annaba.org

Abstract: Facial expression recognition became an important research subject for its diverse applications in human machine interaction. However, many challenges still to be overcome. By the presented work in this paper, we try to provide a new facial expression recognition technique based on combined vectors of multi-feature characterisation of the face. Thus, the face within an image is firstly localised using a simplified method, then it will be characterised in three different ways; by obtaining its Zernike moments feature vectors, known to compact geometric characteristics of the image, then by compiling AR model, supposed to be a representation of its spectral source model and at last, a statistical distribution analysis of the luminance information is performed through the LBP method. Obtained feature vectors were used to train neural network classifiers (NNC) in different manner. To demonstrate the effectiveness of the proposed technique, we record and compare recognition rates for NNC trained with each type of feature vector firstly, then for NNC trained with directly combined feature vectors and finally for NNC trained with composite feature vectors which underwent a fuzzy linear projection operation. Experiments were performed on the JAFFE and Yale database. Recorded results along with comparisons to other methods have affirmed the potency of the proposed approach attaining promising results compared to those reported in the literature.

Keywords: face detection; expression recognition; AR model; Zernike moments; LBP; fuzzy linear projection.


Biographical notes: Mohammed Saaidia obtained his BSc degree in Electronics in 1991 and MSc degree in Signal Processing in 1994 from the University of Annaba, Algeria. He worked as a Lecturer at the Electrical Engineering Department within the University of Tebessa, Algeria from 1994 to 2012 then at the University of Souk Ahras. He was a research fellow within the IBISC laboratory at Evry-Val-d’Essone University (France) between 2005 and 2007. His research interests are in signal processing, pattern recognition, face detection and recognition and face expression recognition.

Narima Zermi received her MS. degree on 2001 from Badji-Mokhtar University of Annaba then her Doctorate in Handwritten Arabic Words Recognition at 2008 from the same university. Her general research interests concern pattern recognition and especially handwritten recognition, face detection, face recognition and facial expression recognition.

Messaoud Ramdani received the doctorate degree in Automatic Control from the University of Annaba, Algeria, in 2006. He is currently a Lecturer in the Department of Electronics, Faculty of Engineering, University Badji-Mokhtar of Annaba, Algeria. He has published over 36 journal and conference papers. His research interests include pattern recognition, fuzzy logic, machine learning, data mining and statistical process control.