Face recognition for varying illumination and different optical zoom using a combination of binary and geometric features

ABSTRACT

Preservation of image features caused by binary conversion is a difficult task under variation of illumination conditions. Several binary conversion-based methods have used an adaptive thresholding technique to improve their performance under illumination variation conditions because of its robustness. However, the performances of existing methods were still limited under high differences illumination conditions especially for uncontrolled lighting sources. In addition, various length of face-to-camera distance gives significant problem affect for the performance of face recognition method. It happens when various images are available for the same person with different length face-to-camera distances due to the appearance of varying facial features of the same person. Therefore, this study proposed to combine the strength normalization and feature-based method to build an illumination distribution model to overcome this problem. With the proposed method the illumination model will fit with variation of illumination conditions in a whole image to generate an adaptive threshold for a novel columnar binary conversion method. The proposed method consists of five main stages, starting with eye area detection using the developed Viola-Jones algorithm. Next, the iris is detected using the Circular Hough Transform (CHT) method and will convert it into binary using the proposed Columnar Binary Conversion (CBC) method to preserve the appearance of the facial features under the illumination variation. Then, the proposed Facial Feature Region Normalization (FFRN) method is performed to improve the effects of different optical zooms for the classification step. The classification is conducted based on the similarity measurement between the extracted normalised binary face region and the dataset that must be converted into their equivalent normalised binary images. The proposed method is evaluated on two different smartphone databases, namely as Smartphone Face Video (SFV) and MOBIO. The performance results showed the outperformance of the proposed method.

Keyword: Face recognition; Illumination variation; Smartphone database; Thresholding technique