International Journal of Innovative
Computing, Information and Control
Volume **7**, Number **4**, April **2011**

ICIC International ©2011 ISSN 1349-4198
pp. **1639–1649**

USING GRADIENT FEATURES FROM SCALE-INVARIANT KEYPOINTS ON FACE RECOGNITION

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Received November 2009; revised March 2010

Abstract. *As the individual identification, access control and security appliance issues attract much attention, face recognition applications are more and more popular. The challenge of face recognition is that the performance is mainly constrained by the variations of illumination, expression, pose and accessory. And most algorithms which were proposed in recent years focused on how to conquest these constraints. In this paper, an algorithm which combines Principal Component Analysis (PCA), Scale Invariant Feature Transform (SIFT) and gradient features to face recognition is proposed. The feature vectors invariant to image scaling and rotation are firstly extracted by SIFT with a different local gradient descriptor. And PCA is applied to the dimension reduction of the local descriptors for saving the computation time. Then the K-means algorithm is introduced to cluster the local descriptors, and the local and global informations of images are combined to classify human faces. Simulation results demonstrate that PCA-SIFT local descriptors are robust to accessory and expression variations and that these descriptors have better performance than other comparative methods. In addition, PCA-SIFT local descriptors have better computation efficiency than standard SIFT local descriptors because of the dimension reduction of the PCA projection.*

Keywords: Face recognition, Scale invariant feature transform, Principal component analysis

1. **Introduction.** Face recognition is an advanced research in image processing and its related issues such as face detection, face tracking and facial expression recognition are well known in human-machine intelligent interaction applications. In recent years, the applications about security issues such as individual identification, access control and security appliance attract much attention. For the convenience of users, a face recognition system is suitable rather than a traditional personal password or an ID card, and has better interaction between human beings and machines. Therefore, face recognition applications become more and more popular [1]. However, it is still a difficult problem because a human face changes greatly in different illumination, pose, expression, accessory and aging conditions. In the variation of facial expressions, the mouth is the most changeable region on the human face and it is often discarded in the preprocess procedure to keep the stability of face features. Nevertheless, the useful classification information in the mouth area is also ignored by discarding the mouth region. On the accessory problem, many papers examine it only with different eyeglasses, whereas face occlusion by hats or hairs will also affect the recognition ability in reality. Therefore, we want to attain better recognition result in more flexible conditions by using robust face features.

The different methods of representing the important and stable features of human faces will greatly affect the performance of face recognition. Many algorithms have been