

IMAGE RECONSTRUCTION FOR FACE RECOGNITION BASED ON FAST ICA

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ABSTRACT. *Traditional ICA (Independent Component Analysis) -based Face Recognition methods obtain a universal subspace by using all trained images. The subspace mainly represents the commonness of human faces but there are a few sights of the individuality owned by a single person's face. In this paper, based on Fast ICA and image reconstruction, we present a novel method for face recognition. When applied to face recognition, the fundamental difference between the traditional ICA and our method is that we obtain the basis images by using each person's pictures respectively, while the traditional way uses the whole training images of the database. After the step above, we obtained the features which would be employed to reconstruct the images by mapping the test images to the basis images. And then we use two ways for face recognition, the first way is adopting the minimum reconstruction error and the second is employing support vector machine (SVM) by using the reconstruction error vectors. Finally, experiments based on three different databases illustrate the effectivity of these methods.*

Keywords: Fast ICA, SVM, Face recognition, Image reconstruction

1. Introduction. Automatic face recognition has been started since the 1970s and currently becomes an active and important research topic because of its wide potential applications such as biometrics systems, security control, personal identification and human-computer communication etc. The wide array of possible applications of face recognition has led to a continuous search for more precise algorithms and techniques. Numerous approaches have been proposed for face recognition and considerable successes have been reported [1, 2]. However, since faces exhibit significant variations due to illuminations, pose and aging variations, a practical performance of automatic face recognition is dissatisfactory.

Among those approaches, subspaces-based methods have been successfully applied, because these methods allow efficient characteristics of a low-dimensional subspace preserving the perceptual quality of a very high-dimensional face image. Eigenface method based on PCA is the most popular method [3, 4]. However, PCA can only separate second-order dependences between pixels, and in the task of face recognition, important information may be contained in the high-order relationship among pixels. So face recognition expects a new method which is sensitive to high-order statistics. ICA is one such method. ICA has emerged as one powerful solution to the problem of blind source separation [5], while its