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Low-rank representation integrated with principal line distance for contactless palmprint recognition

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Abstract

Contactless palmprint recognition has recently begun to draw attention of researchers. Different from conventional palmprint images, contactless palmprint images are captured under free conditions and usually have significant variations on translations, rotations, illuminations and even backgrounds. Conventional powerful palmprint recognition methods are not very effective for the recognition of contactless palmprint. It is known that low-rank representation (LRR) is a promising scheme for subspace clustering, owing to its success in exploring the multiple subspace structures of data. In this paper, we integrate LRR with the adaptive principal line distance for contactless palmprint recognition. The principal lines are the most distinctive features of the palmprint and can be correctly extracted in most cases; thereby, the principal line distances can be used to determine the neighbors of a palmprint image. With the principal line distance penalty, the proposed method effectively improves the clustering results of LRR by improving the weights of the affinities among nearby samples with small principal line distances. Therefore, the weighted affinity graph identified by the proposed method is more discriminative. Extensive experiments show that the proposed method can achieve higher accuracy than both the conventional powerful palmprint recognition methods and the subspace clustering-based methods in contactless palmprint recognition. Also, the proposed method shows promising robustness to the noisy palmprint images. The effectiveness of the proposed method indicates that using LRR for contactless palmprint recognition is feasible.

1. Introduction

Biometric traits, such as face, iris, fingerprint, voice, signature, and gait, have been successfully studied for personal authentication [1,2,3]. As a new and important member of the biometric family, the palmprint, which refers to the inner part of the palm surface, has the merits of high distinctiveness, robustness, and high user-friendliness. A palmprint possesses not only ridges, valleys, and minutiae [4], which can be observed in high-resolution ($\geq$500 ppi) palmprint images, but also some special features