Fingerprint Image Enhancement through Particle Swarm Optimization

Abstract

Fingerprint image enhancement is an essential preprocessing step to extract qualitative minutiae from a fingerprint image. The application of Particle Swarm Optimization (PSO), one of the well known soft computing techniques for fingerprint image enhancement is proposed in this paper. The fingerprint image enhancement algorithm, which is designed based on PSO, is implemented to improve the quality of the image and the clarity of ridges. The objective of the proposed PSO based enhancement method is to maximize an objective fitness criterion in order to enhance the contrast and minutiae detail in a fingerprint image. PSO does not require selection, crossover and mutation operations in comparison to GA. Both objective and subjective evaluations are performed on the resulted fingerprint images. NFIS2 of NIST is used to verify the improvement in the quality of the image. The results are compared with existing techniques like Contrast Limited Adaptive Histogram Equalization (CLAHE), Wiener filter, Median filter. Various experiments were carried out on the fingerprint data sets, which are collected from "CASIA-FingerprintV5" and FVC 2004 of MSU. The proposed PSO based fingerprint enhancement image outperforms many existing enhancement techniques.
References


Index Terms

Computer Science
Image Processing

Keywords
Fingerprint Image Enhancement
Minutiae extraction
PSO