Abstract

Even though many academic and commercial fingerprint recognition systems exist and constant efforts are being put to design more reliable, efficient and high performance matching algorithms, there are research challenges to be resolved to make them interoperable. Fingerprint recognition system is said to be interoperable if its performance remains unchanged even if sensors in the system are changed. Most of the existing matching algorithms fail to incorporate non-linear distortions introduced by different sensors. Hence, their inter-sensor performance is low. In this dissertation, we have targeted fingerprint interoperability in two ways; at Image Level and at Matching Level. Performance evaluation of both the approaches is done on two publicly available databases, MCYT-100 bimodal database and Chinese Academy of Science(CASMS) multi-sensor database.

At image level, we propose a method to standardise fingerprint images into a canonical form which is independent of underlined sensor hardware. We compared the performance of fingerprint matching algorithm Bozorth3 for NIST’s Mindtct template and canonical representation. For MCYT-100 database, canonical representation for cross comparison between images from optical and capacitive sensors shows improvement on Equal Error Rate (EER) from 18.28 to 0.73. For CASMS database, canonical representation for cross comparison between images from optical sensors with different resolutions (500dpi, 569dpi and 700 dpi) shows improvement on EER from 07.94, 23.33 and 22.82 to 04.48, 04.74 and 05.38 respectively.

One of the major reasons which shifted our focus from image level to matcher level is partial fingerprint problem. The proposed matching algorithm identifies common overlapping region between two images based on the ridge-count numbers. Experimental evaluation of the proposed matching algorithm on FVC2002 Db1a gives EER of 0.65 which is better than most of the state-of-art algorithms and significant improvement on EER is observed for cross-sensor comparisons for both MCYT-100 and CASMS databases.