ABSTRACT

Biometric based identification systems are becoming very popular in recent years since security is the main concern in day to day affairs. It is an art of automatically identifying persons based on their physiological and/or behavioural characteristics. When only a single trait is used in a biometric system, it suffers from problems like noisy data, intra and inter class variations, non universality, user acceptance and spoof attacks. A multimodal biometric system provides solution to these problems by combining information from multiple sources. In multibiometric system information fusion need not necessarily combine different biometric traits but also from multiple sensors, multiple instances, multiple algorithms and multiple sample systems.

In this research work, two biometric traits palmprint and finger knuckle print which has high user acceptance, reliability and stability are considered. The images in the data base are first preprocessed to extract a region of interest (ROI) which can be used for feature extraction and matching. This step serves to improve the quality of the images, and to extract only useful information and also reduce the influence of variations resulting from the image data acquisition process. The palmprint recognition system makes use of Gabor filter with single orientation and the phase values are obtained. Next Gabor filter with multiple orientations is applied and the Multiple Orientation XOR features are obtained. They are then encoded to provide the Local Gabor Exclusive-or Pattern (LGXP) feature. The Principal
Component Analysis (PCA) features are extracted from the palmprint as global features which serve to improve image perception and recognition. The minimum scores generated from the MOLGXP and PCA matchers are combined using sum rule and the system provides a recognition rate of 98.98% and an equal error rate of 0.13%.

Next multiple features are extracted from the finger knuckle print using Scale Invariant Feature Transform (SIFT), Speeded Up Robust Features (SURF) and Empirical mode decomposition (EMD) algorithms where both one dimensional and bidimensional EMD are considered. Based on the performance of the individual algorithms, fusion of scores using sum rule for SURF and EMD is done. The fusion of SURF and EMD matching scores provides promising results and a recognition rate of 98.04% and equal error rate of 0.18% and fusion of SURF and BEMD provides recognition rate of 98.46% and equal error rate of 0.17%.

Next a multimodal system based on palmprint and finger knuckle print is proposed. The performance of score level fusion using different rules like min rule, max rule, sum rule and weighted sum rule is analyzed. All the recognition algorithms in this work has been tested on the PolyU database and the proposed work provides better performance in terms of false acceptance rate, false rejection rate, equal error rate and a recognition rate. The proposed multimodal system in which the scores from (MOLGXP+PCA) and (SURF+EMD) are combined using Weighted Sum Rule (OW) provided a recognition rate of 99.92% and equal error rate of 0.003% and that of (MOLGXP+PCA) and (SURF+BEMD) provided a recognition rate of 99.95% and equal error rate of 0.0024%.