

Abstract

Biometrics system has not provided its easiness and robustness as a perfect authentication system until now. The main challenges in biometrics that still become research materials are accuracy which still needs to be improved, large scale biometrics system, and adaptation with uncertain environment.

The proper combination of modalities and feature extraction technique is very important in designing a biometrics system in order to achieve the best performance. Palmprint and palmvein appear as promising modalities used by biometrics system since their uniqueness and easiness in acquisition process. A lot of research has been done with various feature extraction technique such as PCA, ICA, LDA, LBP, and LDP which applied to palmprint or palmvein and generate accuracy exceed 90% each. The design and implementation of multimodal biometrics system using palmprint and palmvein is explained in this research continuing the prior research that succeeds combining them at image level. Two-Dimensional Locality Preserving Projection (2DLPP) is used as feature extraction. 2DLPP is applied to palmprint and palmvein separately to obtain transformation matrix used for projecting each palmprint and palmvein image to feature vector space. The similarity score of palmprint and palmvein feature vector between model and testing data are computed using Euclidean Distance and then combined by applying weight factor to each feature's similarity score.

The result of this research shows the efficiency of 2DLPP algorithm and performance of the system that described in detail into several testing scenario. The parameters to be observed are dimension of feature vector, weight value for feature concatenation scheme, and threshold value for decision making by the system. Base accuracy which measured using total 600 attributes of feature vector for each palmprint and palmvein are 89% and 94.83% respectively. The second accuracy is calculated from the reduced feature vector. The optimum feature vector dimension for palmprint and palmvein are 480 or 80% of total attributes and 360 or 60% of total attributes respectively. The optimum weight coefficient for multimodal scheme with the highest accuracy is obtained from an observation. The optimum weight value is 0.16 which means give 16% of confidence level to palmprint feature and 84% to palmvein feature. It generates 95.83% of accuracy. The optimum threshold value 295.2073 is selected from examination of several threshold values. It generates 94.67% and 97.33% of recognition rate in terms of verification and identification task respectively.

Keywords: *biometrics, multimodal, region of interest, two-dimensional locality preserving projection*