Kernel PCA enabled bit-string representation for minutiae-based cancellable fingerprint template

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Abstract

Minutiae set is one of the prevalent features used to represent a fingerprint. Many minutiae protection schemes have been proposed in recent literature, but only a few have demonstrated successful conversion from minutiae set to fixed-length bit-string. In this paper, we develop a fixed-length binary cancellable fingerprint template generation scheme based on a minutia descriptor known as the multi-line code (MLC). While retaining the core of MLC algorithm, we transform the unordered and variable-size MLC template into an ordered and fixed-length bit-string using kernel principal components analysis (KPCA) and state-of-the-art binarization techniques. The construction of a proper kernel suited for the scenario was validated using Mercer's Theorem. Evaluation of the proposed scheme was performed over several FVC datasets and the best equal-error rate (EER) obtained for the final bit-string is 1.61%. In addition, extensive analysis was done to justify the non-invertibility and revocability property of the cancellable template.

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