Non-fiducial based ECG biometric authentication using one-class support vector machine

ABSTRACT

Identity recognition encounters with several problems especially in feature extraction and pattern classification. Electrocardiogram (ECG) is a quasi-periodic signal which has highly discriminative characteristics in a population for subject recognition. The personal identity verification in a random population using kernel-based binary and one-class Support Vector Machines (SVMs) has been considered by other biometric traits, but has been so far left aside for analysis of ECG signals. This paper investigates the effect of different parameters of data set size, labeling data, configuration of training and testing data sets, feature extraction, different recording sessions, and random partition methods on accuracy and error rates of these SVM classifiers. The experiments were carried out with defining a number of scenarios on ECG data sets designed rely on feature extractors which were modeled based on an autocorrelation in conjunction with linear and nonlinear dimension reduction methods. The experimental results show that Kernel Principal Component Analysis has lower error rate in binary and one-class SVMs on random unknown ECG data sets. Moreover, one-class SVM can be robust recognition algorithm for ECG biometric verification if the sufficient number of biometric samples is available.

Keyword: Identity recognition; Non-fiducial feature extraction; Dimension reduction; Effective parameters