Security analysis and improvement of some biometric protected templates based on Bloom filters

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Arrhythmia Detection From Heart Rate Variability by SDFA method

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Abstract

The Smoothed Detrended fluctuation analysis (SDFA) based on DFA and the principal of wavelet shrinkage procedures is a scaling analysis method to represent the correlation properties of a time series. Since there is not a specific rule for the choice of the numbers of regressors in SDFA Method, we present here an asymptotic optimal choice. We carried out some Monte Carlo simulations on fractional Gaussian noise (FGN) models, to investigate the effect of the numbers of regressors in SDFA Method. We analyze the long dependence property in view of the SDFA method to compare 10 healthy and 10 unhealthy (with cardiac arrhythimia) RR time series randomly selected from databases of the PhysioBank. It is proposed that utilizing Hurst estimator by SDFA method, as an additional diagnostic tool may provide an indication of cardiac arrhythmia.

Keywords: Arrhythmia Detection, Smoothed Detrended Fluctuation Analysis, Hurst Estimator

1 Introduction

The method of Detrended Fluctuation Analysis is proposed based on stochastic process theory and chaos dynamics, which can describe the long-range correlation of non-stationary time series. It has successfully been applied to different fields of interest, such as DNA sequences (see Peng et al., 1994), econophysics (see Grech and Mazur, 2004, Grech and Pamula, 2008 and Grech, 2010), heart rate variability analysis (see Yeh et al., 2006), long-time weather records (see Koscielny-Bunde et al., 1998) and others (see Rhea et al., 2015 and Crato et al., 2010). Theoretical proof about DFA method can be found in Taqqu et al. (1995), Bardet and Kammoun (2008), Crato et al. (2010) and Linhares (2011).