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Mathematical Model with Laplace Autoregressive Process for Heart Rate Signals

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Paper Type Research Article

Paper Title

Mathematical Model with Laplace Autoregressive Process for Heart Rate Signals

Area of Research Mathematics

Paper Issue Volume. 9, Issue. 03 - 62

Abstract

A noise that has is a normal distribution is often added to autoregressive (AR) time series models. Generally, the methods for estimating the parameter of the AR model based on normality assumptions. One of the AR time series models that do not verify normality assumptions is the Laplace AR model. If the estimation method based on the normality assumption is used on the Laplace AR time series model, the estimation method will produce a very biased estimate. This study proposes the reversible jump Markov Chain Monte Carlo (MCMC) algorithm to estimate the parameters of the Laplace AR time series models. The parameters of the Laplace AR time series models are model order, model coefficient, and noise variance. The parameter estimation of the Laplace AR time series models is done in the Bayesian framework. A Binomial distribution is selected as a prior distribution for the model order. A uniform distribution is selected as a prior distribution for the model coefficient. An inverse-Gamma distribution is selected as a prior distribution for the noise variance. This prior distribution is combined with the likelihood function of the data to get the posterior distribution. Parameter estimation is based on the posterior distribution. The reversible MCMC algorithm allows simultaneously estimating the model order, model coefficients, and noise variance. The performance of the algorithm is tested by using some synthetic signals generated from the simulation. The simulation results show that the reversible jump MCMC algorithm can estimate the Laplace AR model parameters well. The advantage of the reversible jump MCMC algorithm is that this algorithm can estimate the parameters of the stationary Laplace AR time series models

Others Information

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