

基于高阶复杂性测度的心率变异信号分析

朱家富^{*1,2}、杨浩¹、何为¹

1 重庆大学电气工程学院电工技术研究所

2 渝西学院物理与电子信息工程系

心率变异性反映了交感神经和迷走神经对心血管系统的综合调节作用,是评价心血管系统功能的重要指标。复杂度是描述时间信号序列信息量的一个重要参数,传统算法中的过分粗略化会丢失大量的有用信息,而高阶复杂度的引入可较大程度地避免这一问题。在利用Lorenz模型数据仿真的基础上,分别对25例正常人样本和25例充血性心力衰竭病人样本的心率变异信号的1~15阶Kolmogorov复杂度进行了计算,通过对比分析后确定,5阶Kolmogorov复杂度在临床医学上可以为分析心率变异信号获得更为理想的效果。

ANALYSIS OF HRV SIGNALS BASED ON THE HIGH-ORDER COMPLEXITY MEASUREMENT

The heart rate variability(HRV) reflects the synthetical function of the parasympathetic-sympathetic nerve to adjust and control the heart and blood system, and it is an important index to evaluate the function of the heart and blood system. The complexity is a valuable parameter representing the information contained in a time series, but the traditional algorithm of measure complexity is so rough that a lot of information contained in the time series will be lost, and this can be avoided by higher order complexity. Based on a simulation of Lorenz model, the all Kolmogorov complexity indexes of two groups of samples of 25 normal populations and 25 congestive heart failure patients were calculated and analyzed, and an important conclusion was given that the 5th order complexity was the best equal complexity index to represent the HRV.

关键词