基于替代数据思想的复杂度归一化方法及其在心电信号分析中的应用

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基于替代数据（Surrogate）思想的复杂度归一化方法，克服了一般复杂度对信号采样长度与采样频率的敏感性。文章对在生物医学信号复杂度分析中最有潜在应用价值的近似熵和C0复杂度进行了归一化。应用该方法可以有效地反映人体心脏某些病理状态之间的差别。同时，通过比较各种复杂度指标发现，C0复杂度和近似熵对采样长度的敏感性最弱，适用于短数据量的信号分析。

Normalization of complexity measures based on Surrogate Approach and its application to ECG signal analysis

Normalization of complexity measures based on surrogate approach overcomes the drawback of sensitivity of complexity measures to window length and sampling rate of signals. In this article, the authors normalized approximate entropy (ApEn) and C0 complexity that were most suitable for complexity analysis of biomedical signals. An application to ECG signals can reflect the difference between some heart diseases effectively. Meanwhile, through the comparison of kinds of complexity measures, it can be found that C0 complexity and approximate entropy (ApEn) have the weakest sensitivity to window length, so it can be used for signal analysis of short length data.

关键词

心电信号 替代数据 归一化复杂度 C0复杂度(ECG; Surrogate data; Normalization of complexity measures; C0 complexity)