

论文

基于过零点-极点估计的瞬时频率幅度算法

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摘要

Hilbert-Huang变换(HHT)理论通过经验模态分解(EMD)提取信号的内蕴模态函数(IMF),并对IMF利用Hilbert变换得到信号的时频幅度谱和边际谱。在总结Hilbert变换理论和算法实现局限性的基础上,提出基于过零点-极点估计求取IMF瞬时频率、幅度算法,通过对离散信号插值运算精确求取过零点和极点位置,并据此求出相应点的瞬时频率和幅度,最后采用三次样条求取信号的瞬时频率幅度曲线。通过几个典型的例子对该算法进行检验,结果表明,与Hilbert变换结果比较,借助该算法得到信号的时频幅度谱和边际谱结果更精确、频率分辨率更好。

关键词 [Hilbert-Huang变换](#) [经验模态分解](#) [内蕴模态函数](#) [过零点-极点估计](#)

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The Algorithm Based on Zero-Crossing and Extremum Estimation to Obtain Instantaneous Frequency and Instantaneous Amplitude

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Abstract

According to Hilbert-Huang Transform (HHT) theory, the signal's Intrinsic Mode Function (IMF) is extracted by Empirical Mode Decomposition (EMD). Its time-frequency-amplitude spectrum and marginal spectrum are obtained by Hilbert transform. In the basis of summarizing the limitation of the Hilbert transform theory and its realization, an algorithm based on zero-crossing and extremum estimation to obtain instantaneous frequency and instantaneous amplitude is presented. The positions of zero-crossings and extrema are obtained accurately by interpolating the discrete signal. The instantaneous frequency and instantaneous amplitude of relative points are obtained. The signal's instantaneous frequency and instantaneous amplitude waveform are obtained by cubic spline interpolation computation. By testing the result and comparing the detail of result with Hilbert transform method through several representative examples, it shows that the instantaneous frequency and instantaneous amplitude obtained by zero-crossing and extremum estimation algorithm are more precise and the frequency resolution is better.

Key words [Hilbert-Huang Transform \(HHT\)](#) [Empirical Mode Decomposition \(EMD\)](#) [Intrinsic Mode Function \(IMF\)](#) [Zero-crossing and extremum estimation](#)

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