

## HHT算法在压电陶瓷驱动器的微纳米位移传感器中的应用

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摘要:

针对信号虽然经过了模拟滤波, 采集到的信号经过数据采集系统后不可避免的含有随机噪声, 噪声限制了传感器的分辨率和系统的动态范围。提出利用HHT算法的经验模态分解对用于压电陶瓷的微纳米传感器采集到的数字信号进行数字滤波, 将采集到的微弱信号进行进一步处理, 以提高微纳米传感器在稳态输出时信号的信噪比从而提高传感器的性能。采用两种方法进行处理。其中一种方法是滤掉经过模态分解后信号中的最高频噪声, 另一种方法是滤掉经过模态分解后信号中的前两阶噪声。最后对比实验结果证实了此算法的有效性, 它能够改善传感器的线性度。

关键词: 压电陶瓷驱动器; 纳米位移传感器; 希尔伯特黄算法; 经验模态分解

## The application of HHT in Mechanical Nanoscale Displacement Sensor of PZT Actuator

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**Abstract:**

This paper describes a relatively new algorithm called Hilbert-Huang transform (HHT) which can utilize empirical mode decomposition(EMD) to filter noise in a nano-scale displacement sensor used in PZT actuator. Although the signals have been pre-filtering processed, the random noise still can't be avoided. Noise limits resolution of sensor and dynamic range of whole system, so the signal should be further handled to improve the Signal to Noise Ratio (SNR) and the property of the sensor. This time two kinds of methods are attempted in this paper. One is the high frequency noise of intrinsic mode functions (IMFs) after EMD are filtered; and the other is to filter the first and second IMFs. Finally, experimental results and comparison studies are provided to verify effectiveness of the proposed HHT algorithm. As a consequence, the linearity of sensor has been improved.

**Keywords:** Piezoelectric Ceramic (PZT) Actuator; Nanoscale displacement sensor; HHT; EMD

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