



基于小波变换的PMN-PT红外传感器读出信号降噪处理

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摘要：

由于弛豫铁电单晶(PMN-PT)优异的压电效应和热释电效应, 使得它对外界的干扰更加敏感, 制成传感器后会比InGaAs等材料产生更多的噪声。本文针对PMN-PT红外传感器读出信号中的白噪声、1/f噪声及其他一些噪声的产生机理、特点进行了分析与研究, 利用计算机仿真出了带有白噪声和1/f噪声、信噪比为0dB左右的读出信号模型。采用db4正交小波基对读出信号进行分解, 并使用改进的阈值对小波细节系数进行处理, 达到降噪的目的。使用FPGA实现了对实测信号的小波去噪, 结果表明, 降噪后信噪比提高了15dB, 提高了红外传感器的性能。

关键词：红外传感器; PMN-PT; 小波变换; 1/f噪声; 白噪声

De-noising of the Infrared Sensors Made from PMN-PT Based on Wavelet Transform

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Abstract:

The relax-based ferroelectric single crystals material (PMN-PT) shows perfect piezoelectric and pyroelectric performance. It has more sensitivities and noises than sensors made from InGaAs. We analyze the characteristics of white noise, 1/f noise and some other noises in the infrared sensor; simulate the model of readout signal with those noises at 0dB. We decompose the readout signal with db4 and dealt the detail coefficients with the improved threshold. Finally we validate the method by the actual signal. The noise of actual signal is reduced by wavelet transform through FPGA. The result shows that the SNR of the signal after de-noise are improved 15dB, and the performance of infrared sensors is improved.

Keywords: infrared sensors; PMN-PT; wavelet transform; 1/f noise; white noise

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