

基于自干涉驱动技术的超声波飞行时间测量系统优化设计

作者：王雪峰, 唐祯安

单位：大连理工大学

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摘要：

超声波飞行时间测量极易受到噪声的干扰而影响检测精度。针对这一难点，本文利用幅值、相位调节技术驱动超声波换能器产生自干涉发射波形，通过相位检测预判接收信号到达时间，结合双阈值拟合算法计算飞行时间。该系统以信号处理器DSP为核心，采用CPLD完成高精度数字相位检测。与传统的超声波飞行时间阈值检测方法相比，该系统具有测量精度高、抑制噪声干扰等优点。

关键词：超声波；自干涉；数值拟合；飞行时间

Optimization on Ultrasonic Time-of-flight Measurement System Based on Self-interference Driving Technology

Author's Name:

Institution:

Abstract:

Ultrasonic time-of-flight determination accuracy can be easily affected by noises in practical measurements. Focusing on this problem, this paper combines with three advanced techniques to achieve the accurate time-of-flight measurement. Firstly, self-interference driving ultrasonic waves are stimulated from the piezoelectric transducer by amplitude and phase modulation techniques. Secondly, phase monitor is used for roughly pre-detecting the received ultrasonic wave arrival time. Finally, double-threshold algorithm is employed for the final time-of-flight determination. In this paper, the system is integrated in a single PCB board which is made up of digital signal processor, complex programmable logic device and some functional modules. Comparing with the traditional ultrasonic time-of-flight threshold crossing method, the system in this paper has some advantages such as high resolution and high noises suppression.

Keywords: ultrasonic wave, self-interference, numerical simulation, time-of-flight

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