迭代优化算法的自校准麦克风阵列声源定位系统

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摘 要：设计了一种七元麦克风阵列，此阵列可以实现三维空间的近场和远场的声源定位同，并且可以进行自校准。该系统基于传统的时延估计算法，设计了在三轴方向上都包含三组麦克风的七元麦克风阵列，具备了自校准功能。在求解时采用了迭代优化算法，利用数值解逼近最优解，可以获取精确的近场和远场声源空间位置定位。该系统不仅适用于水平方位的角度跟踪而且能够三维追踪声源高度，结构简单，体积小，重量轻，携带方便。相较于传统仅适用于远场的近似公式，该算法在近场也能实现声源位置的精确定位，而且算法占用的 RAM 和 ROM 小，运算量小，定位精确。

关键词：迭代优化；声源定位；时延估计算法；自校准

A Sound Source Localization System with Self-calibration Based on Iterative Optimization Algorithm

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Abstract: A seven-microphone array with three microphones in each axis is designed. The array is developed to localize acoustic source of near and far field in three-dimensional space. Moreover, it can achieve self-calibration. The algorithm is composed of two sections. In the first section, the traditional generalized cross correlation is used to obtain the time-delay among each microphone. In the second section, we propose a novel resolving algorithm based on the iterative optimization. Accurate sound source localization can be realized by approaching the target with the numerical solution constantly. Experimental results demonstrate a good performance in localization. It should be emphasized that the space of RAM and ROM occupied by algorithm is small and the speed of computation is fast. Last but not least, traditional approximate formulas are based on the localization of far-field, but the iterative optimization algorithm can be applied accurately for both far-field and near-field.

Key words: iterative optimization; sound localization; time delay estimation algorithm; self-calibration.

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