论文

基于球傅里叶变换的声源三维空间定位

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摘要：

声源的空间方位信息是重建听觉环境重要的因素之一。本文研究了球形麦克风阵列(SMA)在声源空间定位的方法。针对球麦克风的设计，提出了一种等距离分布方法。本文从声学原理出发，利用球傅里叶变换将声场变换到波矢频率（k-ω）域，推导出基于球傅里叶变换的声源定位算法，从而获取其声源方位信息得到各声源的分布情况。声压经虚拟仪器采集后，进行了数值仿真。结果表明，该算法利用球谐波的正交性，可以减少运算量,能获得多声源的准确定位，并且阵列所需的麦克风数量远远小于其他分布。

关键词： 球傅里叶变换 球麦克风阵列 球谐波 声源定位

Localization of Sound Sources Based on Spherical Fourier Transformation in Three Dimension

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Abstract:

The localization's information of sources is the important factor in reconstructing audio environment. Localization of sources is researched using spherical microphone array (SMA). For designing of SMA, a novel criterion on equidistance distribution is provided and applied to sound sources' localization. According to sound's physical characteristic, Sound pressure is expressed as linear combination of different orders' spherical harmony, and is transformed in the domain from space   time to wave number   frequency by spherical Fourier transformation (SFT). The localization of sources is obtained using the algorithm deduced. The sounds' pressure on spherical microphone array was recorded by NI instruments and simulated. The experiments demonstrated that the array with equidistance work well for searching location of sound source with small computation making using of spherical harmony's orthogonality, and the number of microphone is less than other distributions.

Keywords: spherical Fourier transformation；spherical microphone array； spherical harmony；sounds&rsquo localization

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