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可识别声源深度的三维声聚焦波束形成方法

作　者：丁浩, 李春晓, 金江明, 梅东挺, 卢奂采, 柴国钟

单　位：浙江工业大学机械工程学院

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摘　要：

当前平面传声器阵列结合波束形成方法进行声源识别定位时，存在不能确定声源相对全息测量阵列距离的问题，提出了可识别声源深度的三维声聚焦波束形成方法。基于球面波声场模型和波束形成方法，在不同深度的平面上进行声聚焦，首先根据聚焦面上波束形成功率的最大点位置沿聚焦深度方向（即z方向）的轨迹变化判断声源在z方向的位置，再进一步确定声源在x和y方向的位置。为验证方法的有效性，在点声源构成的声场中进行了仿真验证，并且在全消声室内进行了单声源及多声源识别定位的实验验证。仿真结果和实验结果一致表明：该方法能够实现基于平面阵列的三维空间中声源的识别定位。

关键词：聚焦波束形成；三维空间中声源的识别定位；平面阵列；球面波

Sound source depth identifiable three-dimensional focused beamforming

Author's Name:

Institution:

Abstract:

Previously beamforming algorithm with planar microphone array is weak on detecting the distance between sound source and the array. In order to solve this problem, this paper presents an acoustic holography image method depended on virtual mobile plane to locate and to identify the source in 3D. The method is based on beamforming algorithm with the assumption of spherical wave. In this method, the sound field is reconstructed on the planes in the different distance along depth direction (z direction). The maximum response of sound field on every plane is tracked to locate the source on the z direction, and then the source will be located on x and y direction. The method is proved theoretically not only by the simulation under the sound field of a monopole or multi-monopole, but also by the experiment in the anechoic room. Both simulation and experiment results indicate this method is available on locating and identifying sound source in 3D. However it still can't recognize the sound source located in front of the planar array or behind, due to the limitation of the 2D planar array.

Keywords: acoustic focused beamforming; planar microphone array; sound source localization and identification in 3D; spherical wave;

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