

A Robust Deviation-Based Beamformer with Improved Angular Resolution

Dr. Qinghua Ye

Institute of Acoustics, Chinese Academy of Sciences

qhye@sina.com +86-10-62650402

Dr. Haining Huang

Institute of Acoustics, Chinese Academy of Sciences +86-10-62650402

Xinyi He

Institute of Acoustics, Chinese Academy of Sciences +86-10-62650402

Dr. Chunhua Zhang

Institute of Acoustics, Chinese Academy of Sciences +86-10-62650402

Abstract: In this paper, a simple, yet efficient and practical high-resolution beamforming method is presented. In a conventional time-domain-delay-sum beamformer, in order to compensate propagation delay for each element, a delay network of filters and memories are employed. After the delay operation, the sensor signals are multiplied by a set of real weights, and summed. The main difference between the time-domain-delay-sum beamformer and ours is that the delay-sum operation is replaced by a delay-deviate operation. To form a beam in a desired direction, the output of each sensor is delayed by an integer multiple of the sample spacing, then the deviation of the sensor signals in the same wavefront is computed. This structure is repeated N times, where N is the number of beams desired. Associated with each beam direction is a deviation value. After accumulated with a number of snapshots, the output of the N deviation values (the reciprocal) gives the DOA (direction of arrival) estimate. Compared with the CBF (conventional beamforming) method and the broadband MVDR (minimum variance distortionless response) method using real data, the results show that this deviation-based method retains the efficient and robust features of the CBF, yet achieves high resolution as those high resolution approaches such as MVDR.