

Multipath Cancellation Using a Maximum Likelihood Approach

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Abstract: Results of Coastal Systems Station at-sea and test pool experiments with multipath signals using synthetic aperture arrays are presented. It was found that multipath signals are often as strong and sometimes stronger than direct path signals, although the phase of the multipath signals is characteristically quasi-random over the length of the aperture. This randomness leads to some suppression of the multipath signals in conventional synthetic aperture processing. For better multipath cancellation, adaptive methods need to be used. A maximum likelihood method approach for array signal processing that effectively cancels multipath signals is presented. This approach is based on exploiting the orthogonal nature of the signals in the maximum likelihood parameter space. In this space the axes correspond to the primary desired look direction and the various multipath directions. This construction leads to a decoupling of the desired signal from the multipath interference by using maximum likelihood generated array weights. This method is applied to the acoustic data collected in the Coastal Systems Station test pool with a 4-channel vertical array. Results are compared to conventional beamforming methods.