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Adaptive Beamforming Based on Simultaneous Perturbation  
Stochastic Approximation and Reactance-Domain  
MUSIC Algorithm for ESPAR Antennas

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## ABSTRACT

The ESPAR antennas are a kind of parasitic array antennas. Its low power consumption, small dimension, and the ease of fabrication favor the mass commercial deployment of the smart antenna technologies. In this report, a fast convergent adaptive beamforming algorithm based on Simultaneous Perturbation Stochastic Approximation is firstly described. Simulation and experiment justify the algorithm.

Secondly, a novel method, Linear Space Error Correction (LSEC), is proposed to correct the MUSIC DOA estimation errors induced by the difference between the equivalent weight matrix calibrated at the anechoic chamber and the one in real application environment.

Finally, a technique is proposed to increase the number of waves to be estimated using ESPAR reactance domain MUSIC algorithm by using more beam patterns.

***Key words: Digital Beamforming, Simultaneous Perturbation Stochastic Approximation, Multiple Signal Classification (MUSIC), and Antenna Array Calibration***