Adaptive and Array Signal Processing/Processamento de Sinais Adaptativo

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Tutorial Questions/Lista de Exercícios - 8

1. Consider a beamforming problem in which a uniform linear array (ULA) is used and an MVDR beamforming algorithm is employed.



The signal model is given by

where is an N x 1 received vector, is the desired signal and is the steering vector of the desired signal, are the interfering signals that are generated by real Gaussian random variables and are the steering vectors for the k=1,2, ...,K signals impinging on the array. The noise vector represents the measurement noise which is modelled as a complex Gaussian random variable with zero mean and variance . The system employs an MVDR to suppress the interference as shown in the Matlab programme on the website of the course.

Write Matlab recursions to study and simulate the following:

a) Model mismatch errors in the steering vector of the desired signal using complex Gaussian random variables with a variance and design a robust MVDR beamformer with diagonal loading. Show SINR x snapshots, SINR x SNR and beampattern plots.

b) Develop LMS and RLS versions of the MVDR beamformer and compare them using SINR x snapshots, SINR x SNR and beampattern plots.