Contribution ID: **35** Type: **not specified**

Complex Factor Analysis

Tuesday, 26 July 2011 11:00 (40 minutes)

Many techniques for array processing assume either that the system has a calibrated array or that the noise covariance matrix is known.
If the noise covariance matrix is unknown, training or other calibration techniques are used to find it.
Here another approach to the problem of unknown noise covariance is presented.
The factor analysis (FA) model is used to model the data.
In order to make the theory applicable in telecommunication and radio astronomy, the model is extended to the case of complex numbers.
The necessary mathematical tools for estimation, detection and performance analysis are derived.
The maximum likelihood estimator for the FA model in the case of proper complex Gaussian distributed noise and signals is given.
Two different iterative algorithms for finding the MLE of the model parameters are presented.
The necessary iteration steps for an alternating least squares algorithm are also presented.
This is an initial attempt for developing the factor analysis as a tool for signal processing.
The multivariate nature of the theory makes it a good candidate for solving many problems in telecommunication and radio astronomy.

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Session Classification: Calibration 2of2