EXTENT INVARIANT SIGNAL EXTRACTION

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A classical Baysian approach to the problem of detecting the presence of signal in K of M cells where K is unknown (and K and M can be large) is theoretically possible, but practically impossible. Furthermore, if it is desired to partition the K signal components into correlated subsets and provide estimators of the signal component levels, then this type of measurement oriented signal extraction task becomes difficult even to formulate within a Baysian framework. The alternative approach proposed in this paper exploits some basic properties of the eigenvalues (and eigenvectors) of the M-by-M cross-covariance matrix for a data vector containing the observed data in each of the M cells. Specifically, the eigenvalues provide a ready-made detector deflection statistic for each correlated signal subset and the corresponding eigenvectors provide both cell index and signal component relative level estimators. These features combined with minimal storage, adaptive estimation algorithms for the eigenpairs suggest the utility of the proposed technique for the K-of-M signal extraction problem. A particularly interesting feature of this type of detector is that its performance appears to be invariant to the extent of a particular signal subset. That is, assuming constant total energy within a signal subset and infinite time averaging of stationary data, the detector performance is invariant to the number and location of the cells occupied by the components of the particular signal subset.