

Comparison of different approaches to parameter subset selection

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Abstract: Increasing demands on accuracy of models in many fields of applications require comprehensive models which involve large numbers of parameters. Because of limited data available it is in general impossible to identify all parameters of a complex model. Consequently we need systematic methods in order to select those parameters which can be identified with sufficient accuracy on the basis of available data. The different variants of parameter subset selection (PSSS) provide such methods. We shall consider three approaches for PSSS:

- a) Select k out of the p parameters of the model such that the second order approximation of the corresponding least squares formulation of the parameter estimation problem for these k parameters is well-posed. This can be done by application of specific versions of the QR-algorithm to the Fisher information matrix of the problem.
- b) Choose the k largest eigenvalues of the Fisher information matrix for the system with p parameters and take the subspace V of the parameter space generated by the corresponding eigenvectors. Then choose those k parameters such that the subspace generated by the corresponding vectors of the canonical basis of the parameter space has the least distance from V among all k -dimensional subspaces generated by canonical basis vectors.
- c) For an experimental design criterion in terms of the Fisher information matrix choose those k parameters such that the design criterion is minimized respectively maximized for the Fisher information matrix corresponding to the the parameter estimation problem for those k parameters.

For some examples we compare the results obtained by the approaches described above under items a) – c).