Bayesian Network and Feature Selection for Rank Deficient Inverse Problem

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Abstract : Parameter estimation with inverse problem often suffers from unfavorable conditions in the real world. Useless data and many input parameters make the problem complicated or insoluble. Data refinement and reformulation of the problem can solve that kind of difficulties. In this research, a method to solve the rank deficient inverse problem is suggested. A multiphysics system which has rank deficiency caused by response correlation is treated. Impeditive information is removed and the problem is reformulated to sequential estimations using Bayesian network (BN) and subset groups. At first, subset grouping of the responses is performed. Feature selection with singular value decomposition (SVD) is used for the grouping. Next, BN inference is used for sequential conditional estimation according to the group hierarchy. Directed acyclic graph (DAG) structure is organized to maximize the estimation ability. Variance ratio of response to noise is used to pairing the estimable parameters by each response.

Keywords : Bayesian network, feature selection, rank deficiency, statistical inverse analysis
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