

### Improved Parameter Estimation in Model Refinement

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In parameter estimation, an ill-conditioning problem arises from a lack of available data compared to the number of parameters, high measurement noise, insignificant parameters and correlations between parameters. To improve parameter estimability, parameter subset selection has been investigated; the modeler only selects influential and less correlated parameters to estimate while unselected parameters are fixed at their nominal values. Although elimination of correlation between parameters enables unique determination of parameter values, there is no criterion to decide which parameter in a correlated set is more estimable and significant to describe process behavior. In this study, estimation of a subset of transformed parameters to directions of principal components of the covariance matrix is proposed. The proposed method selects parameters to estimate from uncorrelated transformed parameters instead of original correlated parameters, decreasing mean squared error for parameter estimates. Performance of the proposed method is demonstrated from statistical analysis and case studies of linear and nonlinear regression.