



Distribution network optimization: predicting computation times to design scenario analysis for network operators

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Abstract

The increased use of renewable energies promotes decarbonization and raises the load on power distribution networks, forcing responsible distribution network operators to re-evaluate and re-design their networks. Infrastructure planners employ a rolling-horizon planning procedure with frequent recalculations to face informational uncertainty, which require solving multiple scenarios. Keeping complexity manageable is particularly challenging as distribution network areas may span multiple cities and counties. In this study, we focus on infrastructural decomposition, where the distribution network is decomposed into multiple parts and planning problems, which are then optimized separately. However, infrastructure planners lack the knowledge of how they should design a scenario analysis for a subnetwork to account for informational uncertainties subject to limited planning time and computing resources. Based on empirical requirements from literature and discussions with experts, we present a novel mixed integer linear optimization model that allows to use exact solution approaches for realistic large-scale distribution networks. Our approach considers the primary and secondary distribution network in an integrated way and designs a flexible topology for high reliability power distribution. We perform extensive computational experiments and a sensitivity analysis to determine correlations between the values of model parameters and computation times required to solve the resulting model instances to optimality. The results of the sensitivity analysis indicate that the combination of the number of buses, lines and the considered action scope have a considerable influence on the solving time. In contrast, a higher number of available transformers led to a better solvability of the model. From these computational insights, we derive implications for infrastructure planners who wish to perform scenario analysis for planning their power distribution networks.

Keywords OR in energy · Networks · Distribution network optimization · Linear programming

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Optimization Of Design And Computation Of Control Networks

Ferenc Halmos, János Somogyi



Optimization Of Design And Computation Of Control Networks:

Optimization of Design and Computation of Control Networks Optimization of design and computation of control networks International symposium,1979 **Optimization of Design and Computation of Control Networks** Ferenc Halmos,János Somogyi,1979 **Optimization of Design and Computation of Control Networks** International Symposium on Optimization of Design and Computation of Control Networks,1979 **Applications of Linear and Nonlinear Models** Erik Grafarend,Joseph L. Awange,2012-08-15 Here we present a nearly complete treatment of the Grand Universe of linear and weakly nonlinear regression models within the first 8 chapters Our point of view is both an algebraic view as well as a stochastic one For example there is an equivalent lemma between a best linear uniformly unbiased estimation BLUE in a Gauss Markov model and a least squares solution LESS in a system of linear equations While BLUE is a stochastic regression model LESS is an algebraic solution In the first six chapters we concentrate on underdetermined and overdetermined linear systems as well as systems with a datum defect We review estimators algebraic solutions of type MINOLESS BLIMBE BLUMBE BLUE BIQUE BLE BIQUE and Total Least Squares The highlight is the simultaneous determination of the first moment and the second central moment of a probability distribution in an inhomogeneous multilinear estimation by the so called E D correspondence as well as its Bayes design In addition we discuss continuous networks versus discrete networks use of Grassmann Pluecker coordinates criterion matrices of type Taylor Karman as well as FUZZY sets Chapter seven is a speciality in the treatment of an overdetermined system of nonlinear equations on curved manifolds The von Mises Fisher distribution is characteristic for circular or hyper spherical data Our last chapter eight is devoted to probabilistic regression the special Gauss Markov model with random effects leading to estimators of type BLIP and VIP including Bayesian estimation A great part of the work is presented in four Appendices Appendix A is a treatment of tensor algebra namely linear algebra matrix algebra and multilinear algebra Appendix B is devoted to sampling distributions and their use in terms of confidence intervals and confidence regions Appendix C reviews the elementary notions of statistics namely random events and stochastic processes Appendix D introduces the basics of Groebner basis algebra its careful definition the Buchberger Algorithm especially the C F Gauss combinatorial algorithm **Applications of Linear and Nonlinear Models** Erik W. Grafarend,Silvelyn Zwanzig,Joseph L. Awange,2022-10-01 This book provides numerous examples of linear and nonlinear model applications Here we present a nearly complete treatment of the Grand Universe of linear and weakly nonlinear regression models within the first 8 chapters Our point of view is both an algebraic view and a stochastic one For example there is an equivalent lemma between a best linear uniformly unbiased estimation BLUE in a Gauss Markov model and a least squares solution LESS in a system of linear equations While BLUE is a stochastic regression model LESS is an algebraic solution In the first six chapters we concentrate on underdetermined and overdetermined linear systems as well as systems with a datum defect We review estimators algebraic solutions of type

MINOLESS BLIMBE BLUMBE BLUUE BIQUE BLE BIQUE and total least squares The highlight is the simultaneous determination of the first moment and the second central moment of a probability distribution in an inhomogeneous multilinear estimation by the so called E D correspondence as well as its Bayes design In addition we discuss continuous networks versus discrete networks use of Grassmann Plucker coordinates criterion matrices of type Taylor Karman as well as FUZZY sets Chapter seven is a speciality in the treatment of an overjet This second edition adds three new chapters

1 Chapter on integer least squares that covers i model for positioning as a mixed integer linear model which includes integer parameters ii The general integer least squares problem is formulated and the optimality of the least squares solution is shown iii The relation to the closest vector problem is considered and the notion of reduced lattice basis is introduced iv The famous LLL algorithm for generating a Lovasz reduced basis is explained

2 Bayes methods that covers i general principle of Bayesian modeling Explain the notion of prior distribution and posterior distribution Choose the pragmatic approach for exploring the advantages of iterative Bayesian calculations and hierarchical modeling ii Present the Bayes methods for linear models with normal distributed errors including noninformative priors conjugate priors normal gamma distributions and iii short outview to modern application of Bayesian modeling Useful in case of nonlinear models or linear models with no normal distribution Monte Carlo MC Markov chain Monte Carlo MCMC approximative Bayesian computation ABC methods

3 Error in variables models which cover i Introduce the error in variables EIV model discuss the difference to least squares estimators LSE ii calculate the total least squares TLS estimator Summarize the properties of TLS iii explain the idea of simulation extrapolation SIMEX estimators iv introduce the symmetrized SIMEX SYMEX estimator and its relation to TLS and v short outview to nonlinear EIV models The chapter on algebraic solution of nonlinear system of equations has also been updated in line with the new emerging field of hybrid numeric symbolic solutions to systems of nonlinear equations ermined system of nonlinear equations on curved manifolds The von Mises Fisher distribution is characteristic for circular or hyper spherical data Our last chapter is devoted to probabilistic regression the special Gauss Markov model with random effects leading to estimators of type BLIP and VIP including Bayesian estimation A great part of the work is presented in four appendices Appendix A is a treatment of tensor algebra namely linear algebra matrix algebra and multilinear algebra Appendix B is devoted to sampling distributions and their use in terms of confidence intervals and confidence regions Appendix C reviews the elementary notions of statistics namely random events and stochastic processes Appendix D introduces the basics of Groebner basis algebra its careful definition the Buchberger algorithm especially the C F Gauss combinatorial algorithm

INTERNATIONAL SYMPOSIUM ON OPTIMIZATION OF DESIGN AND COMPUTATION OF CONTROL NETWORKS, SOPRON, HUNGARY, 07/04/77 - 07/10/77 F. ED. HALMOS,1979 *Optimization and Design of Geodetic Networks* Erik W. Grafarend,Fernando Sansò,2012-12-06 During the period April 25th to May 10th 1984 the 3rd Course of the International School of Advanced Geodesy entitled Optimization and Design of Geodetic Networks took place in

Erice The main subject of the course is clear from the title and consisted mainly of that particular branch of network analysis which results from applying general concepts of mathematical optimization to the design of geodetic networks As always when dealing with optimization problems there is an a priori choice of the risk or gain function which should be minimized or maximized according to the specific interest of the designer which might be either of a scientific or of an economic nature or even of both These aspects have been reviewed in an introductory lecture in which the particular needs arising in a geodetic context and their analytical representations are examined Subsequently the main body of the optimization problem which has been conventionally divided into zero first second and third order design problems is presented The zero order design deals with the estimability problem in other words with the definition of which parameters are estimable from a given set of observations The problem results from the fact that coordinates of points are not univocally determined from the observations of relative quantities such as angles and distances whence a problem of the optimal choice of a reference system the so called datum problem arises **Advances in Geodesy** Erik W. Grafarend, Richard H. Rapp, 1984

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use data analysis to build decision support systems particularly engineers scientists and statisticians Provided by publisher

International Encyclopedia of Transportation, 2021-05-13 In an increasingly globalised world despite reductions in costs and time transportation has become even more important as a facilitator of economic and human interaction this is reflected in technical advances in transportation systems increasing interest in how transportation interacts with society and the need to provide novel approaches to understanding its impacts This has become particularly acute with the impact that Covid 19 has had on transportation across the world at local national and international levels Encyclopedia of Transportation Seven Volume Set containing almost 600 articles brings a cross cutting and integrated approach to all aspects of transportation from a variety of interdisciplinary fields including engineering operations research economics geography and sociology in order to understand the changes taking place Emphasising the interaction between these different aspects of research it offers new solutions to modern day problems related to transportation Each of its nine sections is based around familiar themes but brings together the views of experts from different disciplinary perspectives Each section is edited by a subject expert who has commissioned articles from a range of authors representing different disciplines different parts of the world and different social perspectives The nine sections are structured around the following themes Transport Modes Freight Transport and Logistics Transport Safety and Security Transport Economics Traffic Management Transport Modelling and Data Management Transport Policy and Planning Transport Psychology Sustainability and Health Issues in Transportation Some articles provide a technical introduction to a topic whilst others provide a bridge between topics or a more future oriented view of new research areas or challenges The end result is a reference work that offers researchers and practitioners new approaches new ways of thinking and novel solutions to problems All encompassing and expertly authored this outstanding reference work will be essential reading for all students and researchers interested in transportation and its global impact in what is a very uncertain world Provides a forward looking and integrated approach to transportation Updated with future technological impacts such as self driving vehicles cyber physical systems and big data analytics Includes comprehensive coverage Presents a worldwide approach including sets of comparative studies and applications

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