Goos, P.; **Donev, A. N.**

Blocking response surface designs. (English) Zbl 1157.62471

Comput. Stat. Data Anal. 51, No. 2, 1075-1088 (2006).

Summary: The design of experiments involving more than one blocking factor and quantitative explanatory variables is discussed, the focus being on two key aspects of blocked response surface designs: optimality and orthogonality. First, conditions for orthogonally blocked experiments are derived. Next, an algorithmic approach to compute D-optimal designs is presented. Finally, the relationships between design optimality and orthogonality in the context of response surface experiments are discussed in detail.

MSC:

62K05 Optimal statistical designs
62K20 Response surface designs

Keywords:

exchange algorithm; D-optimality; fixed blocks; random blocks; orthogonality

Full Text: DOI

References:

[1] Ankenman, B.E.; Avilés, A.I.; Pinheiro, J.C., Optimal designs for mixed effect models with two random nested factors, Statist. sin., 13, 385-401, (2003) · Zbl 1015.62078

[2] Atkinson, A.C.; Donev, A.N., The construction of exact \textit{D}-optimum experimental designs with application to blocking response surface designs, Biometrika, 76, 515-526, (1989) · Zbl 0677.62066

[3] Atkinson, A.C.; Donev, A.N., Optimum experimental design, (1992), Clarendon Press Oxford · Zbl 0829.62070

[4] Box, G.E.P.; Hunter, J.S., Multi-factor experimental designs for exploring response surfaces, Ann. math. statist., 28, 195-241, (1957) · Zbl 0080.35901

[5] Cook, R.D.; Nachtsheim, C.J., Computer-aided blocking of factorial and response-surface designs, Technometrics, 31, 339-346, (1989) · Zbl 0705.62072

[6] Ganju, J., On choosing between fixed and random block effects in some no-interaction models, J. statist. plann. inference, 90, 323-334, (2000) · Zbl 0958.62069

[7] Ganju, J.; Lucas, J.M., Analysis of unbalanced data from an experiment with random block effects and unequally spaced factors, Amer. statist., 54, 5-11, (2000)

[8] Gilmour, S.G.; Trinca, L.A., Some practical advice on polynomial regression analysis from blocked response surface designs, Comm. statist.: theory methods, 29, 2157-2180, (2000) · Zbl 1061.62550

[9] Gilmour, S.G.; Trinca, L.A., Row-column response surface designs, J. qual. technol., 35, 184-193, (2003)

[10] Goos, P., The optimal design of blocked and split-plot experiments, (2002), Springer New York · Zbl 1008.62068

[11] Goos, P., Donev, A.N., 2006. The \textit{D}-optimal design of blocked experiments with mixture components. J. Qual. Technol., to appear.

[12] Goos, P.; Tack, L.; Vandebroek, M., The optimal design of blocked experiments in industry, (), 247-279 · Zbl 1311.62116

[13] Goos, P.; Vandebroek, M., \textit{D}-optimal response surface designs in the presence of random block effects, Comput. statist. data anal., 37, 433-453, (2001) · Zbl 1079.62532

[14] Goos, P.; Vandebroek, M., Estimating the intercept in an orthogonally blocked experiment when the block effects are random, Comm. statist.: theory methods, 33, 873-890, (2004) · Zbl 1066.62076

[15] Khuri, A.I., Response surface models with random block effects, Technometrics, 34, 26-37, (1992) · Zbl 0850.62618

[16] Khuri, A.I., Effect of blocking on the estimation of a response surface, J. appl. statist., 21, 305-316, (1994)

[17] Miller, A.J.; Nguyen, N.K., AS 295—A fedorov exchange algorithm for \textit{D}-optimal design, Appl. statist., 43, 669-678, (1994)

[18] Trinca, L.A.; Gilmour, S.G., An algorithm for arranging response surface designs in small blocks, Comput. statist. data anal., 33, 25-43, (2000) · Zbl 1061.62551

paper as accurately as possible without claiming the completeness or perfect precision of the matching.