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Robustness of orthogonal-array based composite designs to missing data

Xue-Ping Chen[1,2], Bing Guo[1], Min-Qian Liu[1], Xiao-Lei Wang[1]

[1] *LPMC and Institute of Statistics, Nankai University, Tianjin 300071, China*

[2] *Department of Mathematics, Jiangsu University of Technology, Changzhou, 213001, China*

Abstract

Missing observations can hardly be avoided even by a well-planned experiment. Based on the orthogonal-array based composite designs proposed by Xu et al. (2014), new orthogonal-array based composite minimax loss designs are constructed. Comparisons between the proposed designs and other composite designs, including orthogonal-array based composite designs, augmented pairs designs, augmented pairs minimax loss designs, central composite designs, and small composite designs are made in detail, which show that the new composite designs are more robust to one missing design point in terms of the D-efficiency and generalized scaled standard deviation. Moreover, it is demonstrated that the D-efficiency remains unchanged for both level permutation and column permutation in some special cases.

Keywords: Composite design; D-efficiency; Generalized scaled standard deviation; Minimax loss criterion.

AMS subject Classification: 62K20, 62K15.

1 Introduction

In statistics, missing data is a common occurrence and can have a significant effect on the conclusions drawn from the data. The effect of missing observations can be of particular concern when the design is nearly saturated, saturated, or supersaturated. Many authors have discussed the robustness of statistical designs against missing data. For example, Akhtar and