MISSING OBSERVATIONS IN SIX FACTOR BOX AND BEHNKEN DESIGN

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ABSTRACT

The loss of efficiency due to one or two missing observations in six factor Box and Behnken design is studied under minimax-loss criterion. The robustness of this design is then compared with six factor central composite designs robust to one or two missing observarions.

INTRODUCTION

Second order response surface designs are particularly suitable for the estimation of second order model. Central composite designs introduced by Box [3] and further developed by Box and Hunter [5] are mostly used second order designs.

Another type of second order designs was introduced by Box and Behnken [4]. These designs are usually refered to as Box and Behnken designs. They are formed by arranging 2^2 or 2^3 factorial design in an incomplete block design formation. For example the design matrix D for a six factor Box and Behnken design with 48 factorial and 6 centre design points is

$$
D = \begin{bmatrix}
[C_1] & [C_2] & \underset{\sim}{0} & [C_3] & \underset{\sim}{0} & \underset{\sim}{0} \\
\underset{\sim}{0} & [C_1] & [C_2] & \underset{\sim}{0} & [C_3] & \underset{\sim}{0} \\
\underset{\sim}{0} & \underset{\sim}{0} & [C_1] & [C_2] & \underset{\sim}{0} & [C_3] \\
[C_1] & \underset{\sim}{0} & \underset{\sim}{0} & [C_2] & [C_3] & \underset{\sim}{0} \\
\underset{\sim}{0} & [C_1] & \underset{\sim}{0} & \underset{\sim}{0} & [C_2] & [C_3] \\
[C_1] & \underset{\sim}{0} & [C_2] & \underset{\sim}{0} & \underset{\sim}{0} & [C_3] \\
\underset{\sim}{0} & \underset{\sim}{0} & \underset{\sim}{0} & \underset{\sim}{0} & \underset{\sim}{0} & \underset{\sim}{0}
\end{bmatrix}
$$

where $[C_1], [C_2]$ and $[C_3]$ are first, second and third column of