

# A robust second phase design of response surface methods<sup>1</sup>

by

Yong B. Lim & Man-Suk Oh

Department of statistics, Ewha Womans University, Seoul 120-750, Korea.

## Abstract.

In the second phase of the response surface methods, the first-order model is assumed and the curvature of the response surface is checked with a fractional factorial design augmented by centre runs. We further assume that a true model is of the second order. Box and Draper(1963) suggested the use of an average mean squared error (AMSE), an average of MSE of  $\hat{y}(x)$  over the region of interest R. The AMSE can be partitioned into the average prediction variance (APV) and average squared bias (ASB). Since AMSE is a function of design moments, region moments and a standardized vector of parameters, it is not possible to select the design that minimizes AMSE. As a practical alternative, Box and Draper(1963) proposed minimum bias design which minimize ASB and showed that factorial design points are shrunk toward the origin for a minimum bias design. In this paper we propose a robust AMSE design which maximizes the minimum efficiency of the design with respect to a standardized vector of parameters. Factorial design points of robust AMSE design turn out to be less shrunk than those of minimum bias design.

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<sup>1</sup>This work was supported in part by a grant 99-N6-01-01-A-03 for the Woman's University from Korea Ministry of Science and Technology.