

**A New Graphical Approach for Comparing Response Surface
Designs on the Basis of the Mean Squared Error of Prediction
Criterion**

By

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Abstract

The quality of prediction of a response surface model is measured by the size of its mean squared error within the region of experimentation. The so-called *mean squared error of prediction* (MSEP) consists of the prediction variance and a measure of bias caused by model misspecification. The purpose of this article is to present a new graphical technique for evaluating and comparing response surface designs using the minimization of the MSEP as a design criterion. Three MSEP-related criteria functions are introduced and plots of their quantile values are obtained on concentric spheres within a region of interest. These plots provide complete information concerning the distribution of each criterion function over the selected spheres. Such information readily depicts the performance of a given design under model misspecification. Furthermore, the proposed criteria are free of any unknown parameters that pertain to the unfitted true model and error variance. Several examples are presented to illustrate the application of the proposed graphical approach and its potential in design augmentation.