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A Criterion to Optimize the Mean and the Variance at the Same Time in a Robust Parameters Problem

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Abstract: In recent years response surface methodology has been successfully applied to solve robust parameter problems. In these problems, a process is modeled including controllable factors along with the uncontrollable or noise factors with the purpose of finding settings of the control factors that are insensitive or "robust" to noise variability. A typical example of a noise factor is the weather conditions. In a robust parameter problem, usually there are two main objectives: to reach a desired target for the mean of the process and to minimize the variance. To describe the behavior of both the mean and the variance, some researchers have proposed to use the dual response surface approach where there is a response surface for the mean and another response surface for the variance. To optimize both response surfaces a single criterion has been suggested combining both equations in a single one. Then, to define a priority between the mean and the variance, some researchers have suggested assigning a weight of two for the variance, considering the variance twice as important as the mean. The purpose of this article is to test if a different weight for the variance gives a better solution for a robust parameter problem. In particular, three different values for the weight were tested. Five case studies were solved using the three different weights. In general, the results indicated that the larger the weight for the variance the better the solution for the robust parameter problem.

Keywords: Robust Parameter Design, Response Surface Methodology, Dual Response Surface Method, Design of Experiments