An Enhanced Recursive Stopping Rule for Steepest Ascent Searches in Response Surface Methodology

Guillermo Miró and Enrique del Castillo

Abstract

In traditional Response Surface Methods (RSM) the fitting of a factorial design (possible factional) is followed by a steepest ascent search using the vector of first order parameter estimates as an approximation for the gradient. In the presence fo variability in the responses, there is a need for a stopping rule to determine the optimal point in the search direction. Two formal stopping rules have been proposed in the literature, Myers and Khuri's (MK) stopping rule and Del Castillo's recursive parabolic rule. The first rule requires the specification of an initial guess on the location of the optimum, while the performance of the latter rule has noly been studied for quadratic responses. This paper proposes some modifications to the recursive parabolic rule in order to increase its robustness for non-quadratic responses. The modifications include using only a fraction of the experiments made along the search and the estimation of all the parameters in the recursive model. It also compares, using simulation experiments, the performance of the aforementioned rules, together with classical rules of stopping after 1, 2 or 3 consecutive drops, under non-quadratic and non-normally distributed responses. It was observed that the original recursive parabolic rule stops before the optimum under non-quadratic behavior, while the modified parabolic rule and MK rule perform satisfactorily under most of the simulated conditions.