

# DESIGNING SIMULATION EXPERIMENTS: TAGUCHI METHODS AND RESPONSE SURFACE METAMODELS

## Abstract

Genichi Taguchi has made an innovative contribution to quality planning activities through the integrated use of loss functions and orthogonal arrays. In this tutorial, we focus on the improvement and implementation of certain of these techniques in the simulation arena. The orthogonal arrays advocated by Taguchi are related to classical experimental designs, which have played important tactical roles in the exploration of simulation model output and the construction of mathematical metamodels for the simulation response surface. However, the loss function and the associated robust design philosophy provide fresh insights into the process of optimizing or improving the simulation's performance. We use examples to illustrate concepts such as the simultaneous treatment of variability and mean of performance measures, strategies for achieving system robustness, and implementation of noise (uncontrollable variation) through factorial designs. We also discuss relationships to other issues in designing and analyzing simulation experiments, such as response surface metamodels and variance reduction. The tutorial is meant for both practitioners and researchers. We assume a knowledge base at the level of Chapters 11 and 12 of *Simulation Modeling and Analysis* (Law and Kelton, 1991), but will review essential elements in the presentation.

## Full citation:

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