Design of Experiments

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Outline

- What is Design of Experiments?
- Method
  - Step 1: Model Variables
  - Step 2: Set Variable Targets
  - Step 3: Experimental Plan
  - Step 4: Testing
  - Step 4: Analysis
- Effects, Replicates & Interactions

Design of Experiments

- Design of Experiments (DOE) def'n:
  - A theory which indicates the minimum number of experiments necessary to develop an *empirical* model of a physical phenomenon and a methodology for setting up the experiments
- DOE represents the adoption by scientists and engineers of experimental methods used by psychologists for years

DOE Goal

- Overall goal:
  - To model a performance parameter (i.e., a physical phenomenon) as a function of design variables (i.e., things we can control about the design)
- Our approach:
  - Follow the DOE methodology

Step 1: Model Variables

- Goal: $y = f(x_1, x_2, x_3, …)$
- Identify performance parameter (y) and design variables $(x_1, x_2, x_3, …)$
  - Design variables = *control* variables
  - n = # of design variables
- Note any noise variables (things which you can not control)