

INTERACTION FOR THREE FACTORS

Interaction generally: Any significant deviation from an additive (main effect) model.

Example: Pollution noise data

(<http://lib.stat.cmu.edu/DASL/Datafiles/airpollutionfiltersdat.html>)

These data were presented by Texaco, Inc. in 1973 to assert their claim that the Octel pollution filter was at least equal in noise reduction as standard silencers.

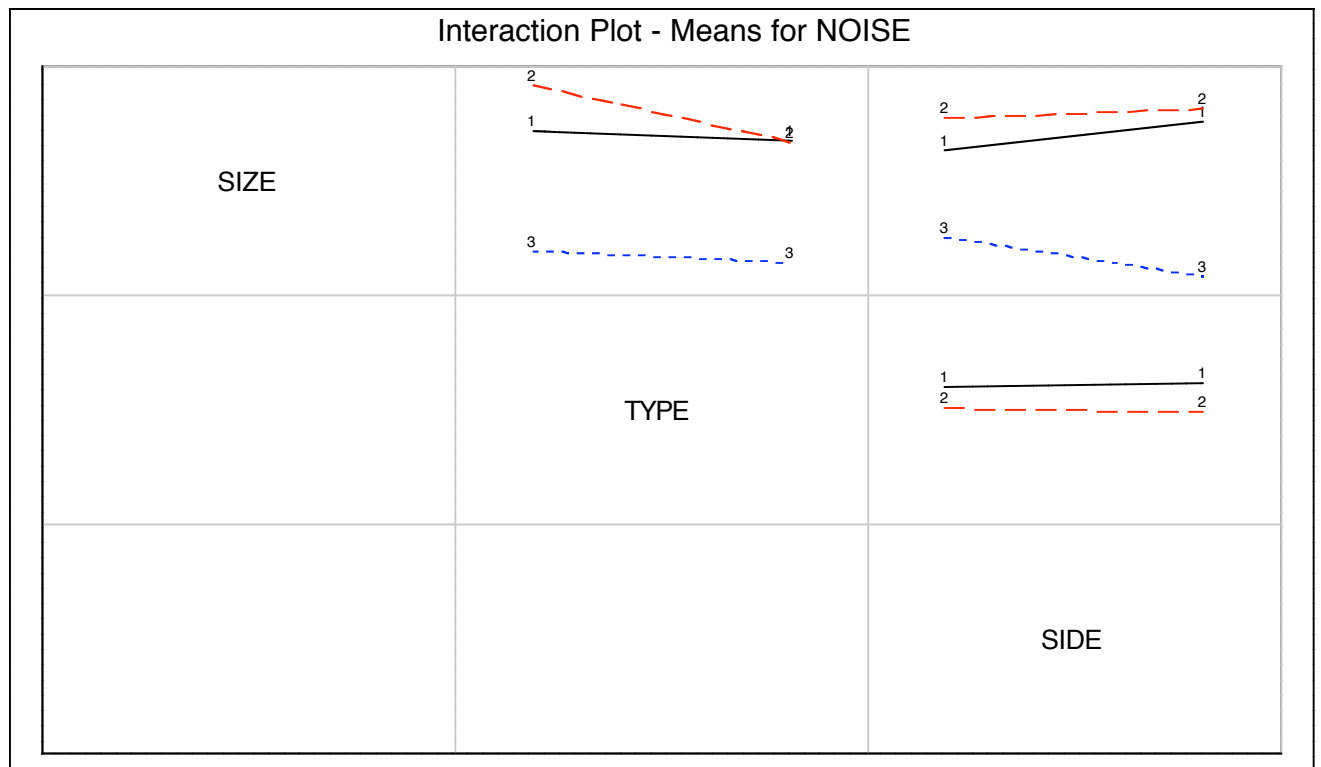
Variables: NOISE = Noise level reading (decibels)

SIZE = Vehicle size: 1 small, 2 medium, 3 large

TYPE: 1 standard silencer, 2 Octel filter

SIDE : 1 right side of car, 2 left side of car

Minitab will give a matrix of 2-way interaction plots:



What 2-way interactions do these plots suggest?

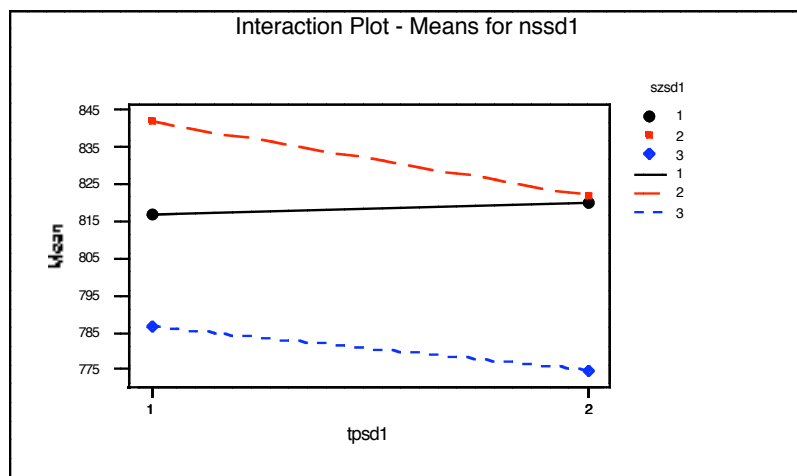
Three-way interaction: Three-way interaction occurs when there is *any significant difference in two-way interaction plots corresponding to different levels of the third variable*.

Does the above plot allow us to detect three-way interaction?

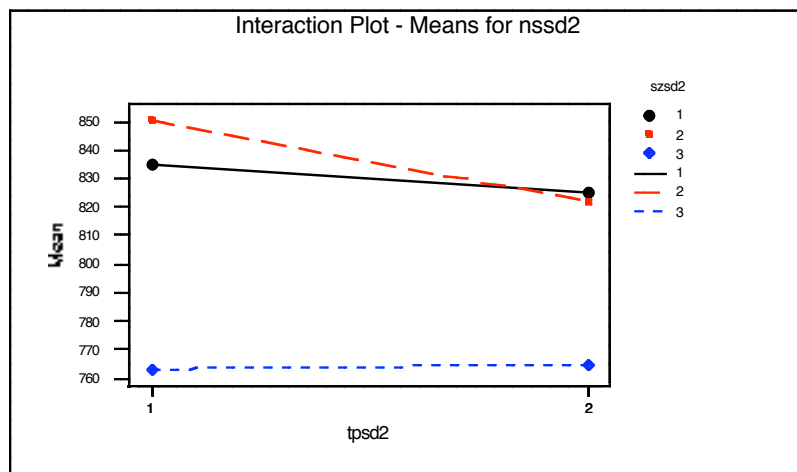
Three-way Interaction plots with Minitab:

1. Unstack two factors and response by the third factor.
2. Use the unstacked data to form one interaction plot for each level of the third factor.

Interaction plot of type and size for side = 1:



For side = 2:



Interaction plots of type and size for side = 1, 2, 3, respectively:

