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MAS 314

Design of Experiments

Practical 4

31 January–6 February 2007

In this practical we shall see how to create and randomize some simple designs with equal replication.

1 (An unstructured design with equal replication) We will produce the randomized design for the technician in Question 2 of Assignment 2. Use the mouse:

Stats → Design → Generate a Standard Design

then choose/type

Design:	<input type="text" value="Completely Randomized Design"/>
No. of Treatment Factors:	<input type="text" value="1"/>
No. of Replications:	<input type="text" value="3"/>
Treatment factor 1:	<input type="text" value="Soil"/>
No. of Levels:	<input type="text" value="4"/>

and tick all of the following.

- Unit Labels**
- Randomize Design**
- Dummy ANOVA table**
- Display design in spreadsheet**

Click on .

Look at the spreadsheet and at the output window. Do you understand what the “dummy ANOVA” is? Can you say what would happen if you removed any of the ticks?

2 (Complete-block design, First method) We will construct and then randomize the design for wine-tasting which will be covered in lectures in early February. It has 8 judges each tasting all of 4 wines.

Start in the same way as for the previous design, but choose

General Treatment Structure (in Randomized Blocks)

Then fill in the boxes as follows.

No. of Treatment Factors:	1	
Blocks:	Judges	8
Units within blocks:	Tastings	
Treatment factor 1:	Wine	4

Make sure that you understand what has happened in the spreadsheet and in the dummy ANOVA. Make notes below.

This method is simple, but it is rather like a recipe book.

3 (Complete-block design, Second method) Now we will construct and randomize the wine-tasting design again, using a slower method that is more easy to adapt to more complicated designs.

We shall deliberately use slightly different names for the factors.

First we generate the observational units in standard order.

Stats → Design → Generate Factors in Standard Order

Enter the factor name `Expert` with 8 levels, then click on ; then the factor name `Glass` with 4 levels, then click on ; then make sure that you have ticked the box for `Display factors in spreadsheet`; and then click on . Can you see what has happened at this stage?



Secondly, construct the systematic design using

Spread → Column → Duplicate

to copy the `Glass` column to another column called `Wine2`.

Thirdly, randomize this systematic design, using

Stats → Design → Randomize

Fill in the boxes:

Randomize:
Block Structure:

What Genstat calls ‘block structure’ is very important. It is what the lecture notes call ‘plot structure’.

The syntax `Expert/Glass` has several different (but related) meanings, depending on the context. The best way to think about it is that it means “Glasses *within* Experts”. When the context is randomization, this means that Genstat will randomly permute the Experts, and then randomly permute the Glasses within each Expert. Of course, it then renames these in standard order, so it is only the factor `Wine2` that appears to have a new order.

Finally, to save the randomized version of the design, do

Spread → Update → Changed data to Genstat