Supplmentary material for "Towards a unified language in experimental designs propagated by a software framework"

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Applications

The following code uses the R-package `edibble` (Tanaka 2023) in the R language (R Core Team 2020) to construct three types of experimental design described in the main paper. The full design tables for the split-plot design, complex nested design and unbalanced factorial design are shown in Table 1, Table 2 and Table 3, respectively.

```
library(edibble)
```

Classic Split-Plot Design

The experiment, described in Fisher (1950), is a classic split-plot design for testing the yield of a crop with 12 varieties under 3 different types of fertilizer.

Below we define the unit and treatment factors.

```
des1str <- design("Fisher's split-plot design") %>%
  set_units(patch = 36,
            plot = nested_in(patch, 3)) %>%
  set_trts(variety = 12,
           fertilizer = c("basal", "sulphate", "chloride"))
```

You may also set the responses.

```
des1strr <- des1str %>%
  set_rcrds(yield = plot,
            biomass = patch)
```

At this stage, the design is not complete and stored in the network form.

```
des1strr
```

```
Fisher's split-plot design
+-patch (36 levels)
| +-plot (108 levels)
| | \-yield
| \-biomass
+-variety (12 levels)
\-fertilizer (3 levels)
```

We need to specify the relationship between factors. We can then get the design table.

```
des1 <- des1strr %>%
  allot_trts(variety ~ patch,
             fertilizer ~ plot) %>%
  assign_trts(seed = 1,
              order = c("random", "random")) %>%
  serve_table()
```

The output is a special class of `data.frame`. See Table 1 for the full design table.

```
des1
```

```
# Fisher's split-plot design
# An edibble: 108 x 6
       patch        plot   variety fertilizer  yield biomass
   <unit(36)> <unit(108)> <trt(12)>   <trt(3)> <rcrd>  <rcrd>
1     patch1       plot1  variety11   sulphate      o       o
2     patch1       plot2  variety11   chloride      o       x
3     patch1       plot3  variety11   basal         o       x
4     patch2       plot4  variety9    chloride      o       o
5     patch2       plot5  variety9    sulphate      o       x
6     patch2       plot6  variety9    basal         o       x
7     patch3       plot7  variety6    sulphate      o       o
8     patch3       plot8  variety6    basal         o       x
```

```
 9      patch3      plot9  variety6      chloride      o      x
10      patch4      plot10 variety2      basal         o      o
# i 98 more rows
```

Table 1: Design table output for the classic split plot design.

patch	plot	variety	fertilizer	yield	biomass
patch1	plot1	variety11	sulphate	NA	NA
patch1	plot2	variety11	chloride	NA	NA
patch1	plot3	variety11	basal	NA	NA
patch2	plot4	variety9	chloride	NA	NA
patch2	plot5	variety9	sulphate	NA	NA
patch2	plot6	variety9	basal	NA	NA
patch3	plot7	variety6	sulphate	NA	NA
patch3	plot8	variety6	basal	NA	NA
patch3	plot9	variety6	chloride	NA	NA
patch4	plot10	variety2	basal	NA	NA
patch4	plot11	variety2	chloride	NA	NA
patch4	plot12	variety2	sulphate	NA	NA
patch5	plot13	variety5	basal	NA	NA
patch5	plot14	variety5	chloride	NA	NA
patch5	plot15	variety5	sulphate	NA	NA
patch6	plot16	variety5	sulphate	NA	NA
patch6	plot17	variety5	chloride	NA	NA
patch6	plot18	variety5	basal	NA	NA
patch7	plot19	variety8	basal	NA	NA
patch7	plot20	variety8	sulphate	NA	NA
patch7	plot21	variety8	chloride	NA	NA
patch8	plot22	variety10	chloride	NA	NA
patch8	plot23	variety10	sulphate	NA	NA
patch8	plot24	variety10	basal	NA	NA
patch9	plot25	variety1	basal	NA	NA
patch9	plot26	variety1	sulphate	NA	NA
patch9	plot27	variety1	chloride	NA	NA
patch10	plot28	variety3	chloride	NA	NA
patch10	plot29	variety3	sulphate	NA	NA
patch10	plot30	variety3	basal	NA	NA
patch11	plot31	variety3	chloride	NA	NA
patch11	plot32	variety3	basal	NA	NA
patch11	plot33	variety3	sulphate	NA	NA
patch12	plot34	variety8	basal	NA	NA
patch12	plot35	variety8	sulphate	NA	NA

patch	plot	variety	fertilizer	yield	biomass
patch12	plot36	variety8	chloride	NA	NA
patch13	plot37	variety3	chloride	NA	NA
patch13	plot38	variety3	sulphate	NA	NA
patch13	plot39	variety3	basal	NA	NA
patch14	plot40	variety12	basal	NA	NA
patch14	plot41	variety12	sulphate	NA	NA
patch14	plot42	variety12	chloride	NA	NA
patch15	plot43	variety11	basal	NA	NA
patch15	plot44	variety11	sulphate	NA	NA
patch15	plot45	variety11	chloride	NA	NA
patch16	plot46	variety12	sulphate	NA	NA
patch16	plot47	variety12	chloride	NA	NA
patch16	plot48	variety12	basal	NA	NA
patch17	plot49	variety10	basal	NA	NA
patch17	plot50	variety10	chloride	NA	NA
patch17	plot51	variety10	sulphate	NA	NA
patch18	plot52	variety4	basal	NA	NA
patch18	plot53	variety4	chloride	NA	NA
patch18	plot54	variety4	sulphate	NA	NA
patch19	plot55	variety5	basal	NA	NA
patch19	plot56	variety5	chloride	NA	NA
patch19	plot57	variety5	sulphate	NA	NA
patch20	plot58	variety11	basal	NA	NA
patch20	plot59	variety11	chloride	NA	NA
patch20	plot60	variety11	sulphate	NA	NA
patch21	plot61	variety8	chloride	NA	NA
patch21	plot62	variety8	sulphate	NA	NA
patch21	plot63	variety8	basal	NA	NA
patch22	plot64	variety9	sulphate	NA	NA
patch22	plot65	variety9	chloride	NA	NA
patch22	plot66	variety9	basal	NA	NA
patch23	plot67	variety7	basal	NA	NA
patch23	plot68	variety7	chloride	NA	NA
patch23	plot69	variety7	sulphate	NA	NA
patch24	plot70	variety1	chloride	NA	NA
patch24	plot71	variety1	basal	NA	NA
patch24	plot72	variety1	sulphate	NA	NA
patch25	plot73	variety7	basal	NA	NA
patch25	plot74	variety7	chloride	NA	NA
patch25	plot75	variety7	sulphate	NA	NA
patch26	plot76	variety7	chloride	NA	NA

patch	plot	variety	fertilizer	yield	biomass
patch26	plot77	variety7	basal	NA	NA
patch26	plot78	variety7	sulphate	NA	NA
patch27	plot79	variety2	basal	NA	NA
patch27	plot80	variety2	chloride	NA	NA
patch27	plot81	variety2	sulphate	NA	NA
patch28	plot82	variety12	basal	NA	NA
patch28	plot83	variety12	chloride	NA	NA
patch28	plot84	variety12	sulphate	NA	NA
patch29	plot85	variety4	basal	NA	NA
patch29	plot86	variety4	sulphate	NA	NA
patch29	plot87	variety4	chloride	NA	NA
patch30	plot88	variety4	chloride	NA	NA
patch30	plot89	variety4	basal	NA	NA
patch30	plot90	variety4	sulphate	NA	NA
patch31	plot91	variety9	sulphate	NA	NA
patch31	plot92	variety9	basal	NA	NA
patch31	plot93	variety9	chloride	NA	NA
patch32	plot94	variety6	chloride	NA	NA
patch32	plot95	variety6	sulphate	NA	NA
patch32	plot96	variety6	basal	NA	NA
patch33	plot97	variety1	sulphate	NA	NA
patch33	plot98	variety1	chloride	NA	NA
patch33	plot99	variety1	basal	NA	NA
patch34	plot100	variety2	basal	NA	NA
patch34	plot101	variety2	chloride	NA	NA
patch34	plot102	variety2	sulphate	NA	NA
patch35	plot103	variety10	sulphate	NA	NA
patch35	plot104	variety10	basal	NA	NA
patch35	plot105	variety10	chloride	NA	NA
patch36	plot106	variety6	sulphate	NA	NA
patch36	plot107	variety6	chloride	NA	NA
patch36	plot108	variety6	basal	NA	NA

Complex Nested Design

Consider next the experiment in Martin, Johnson, and Forsyth (1996) aimed to investigate if insecticides used to control grasshoppers affected the weight of young chicks of ring-necked pheasants, either by affecting the grass around the chicks or by affecting the grasshoppers eaten by the chicks.

```
1   des2 <- design("Complex nested factorial design") %>%
2     set_trts(insecticide = 3,
3              dose_level  = c("low", "high"),
4              food_type   = c("sprayed", "unsprayed")) %>%
5     set_units(week  = 3,
6               strip = nested_in(week, 3),
7               swath = nested_in(strip, 2),
8               pen   = nested_in(swath, 2),
9               chick = nested_in(pen, 6)) %>%
10    allot_trts(insecticide ~ strip,
11               dose_level ~ swath,
12               food_type ~ pen) %>%
13    assign_trts(seed = 1) %>%
14    serve_table()
```

Table 2: Design table output for the complex nested design.

insecticide	dose_level	food_type	week	strip	swath	pen	chick
insecticide2	high	unsprayed	week1	strip1	swath1	pen1	chick1
insecticide2	high	unsprayed	week1	strip1	swath1	pen1	chick2
insecticide2	high	unsprayed	week1	strip1	swath1	pen1	chick3
insecticide2	high	unsprayed	week1	strip1	swath1	pen1	chick4
insecticide2	high	unsprayed	week1	strip1	swath1	pen1	chick5
insecticide2	high	unsprayed	week1	strip1	swath1	pen1	chick6
insecticide2	high	sprayed	week1	strip1	swath1	pen2	chick7
insecticide2	high	sprayed	week1	strip1	swath1	pen2	chick8
insecticide2	high	sprayed	week1	strip1	swath1	pen2	chick9
insecticide2	high	sprayed	week1	strip1	swath1	pen2	chick10
insecticide2	high	sprayed	week1	strip1	swath1	pen2	chick11
insecticide2	high	sprayed	week1	strip1	swath1	pen2	chick12
insecticide2	low	unsprayed	week1	strip1	swath2	pen3	chick13
insecticide2	low	unsprayed	week1	strip1	swath2	pen3	chick14
insecticide2	low	unsprayed	week1	strip1	swath2	pen3	chick15
insecticide2	low	unsprayed	week1	strip1	swath2	pen3	chick16
insecticide2	low	unsprayed	week1	strip1	swath2	pen3	chick17
insecticide2	low	unsprayed	week1	strip1	swath2	pen3	chick18
insecticide2	low	sprayed	week1	strip1	swath2	pen4	chick19
insecticide2	low	sprayed	week1	strip1	swath2	pen4	chick20
insecticide2	low	sprayed	week1	strip1	swath2	pen4	chick21
insecticide2	low	sprayed	week1	strip1	swath2	pen4	chick22
insecticide2	low	sprayed	week1	strip1	swath2	pen4	chick23

insecticide	dose_level	food_type	week	strip	swath	pen	chick
insecticide2	low	sprayed	week1	strip1	swath2	pen4	chick24
insecticide3	high	sprayed	week1	strip2	swath3	pen5	chick25
insecticide3	high	sprayed	week1	strip2	swath3	pen5	chick26
insecticide3	high	sprayed	week1	strip2	swath3	pen5	chick27
insecticide3	high	sprayed	week1	strip2	swath3	pen5	chick28
insecticide3	high	sprayed	week1	strip2	swath3	pen5	chick29
insecticide3	high	sprayed	week1	strip2	swath3	pen5	chick30
insecticide3	high	unsprayed	week1	strip2	swath3	pen6	chick31
insecticide3	high	unsprayed	week1	strip2	swath3	pen6	chick32
insecticide3	high	unsprayed	week1	strip2	swath3	pen6	chick33
insecticide3	high	unsprayed	week1	strip2	swath3	pen6	chick34
insecticide3	high	unsprayed	week1	strip2	swath3	pen6	chick35
insecticide3	high	unsprayed	week1	strip2	swath3	pen6	chick36
insecticide3	low	unsprayed	week1	strip2	swath4	pen7	chick37
insecticide3	low	unsprayed	week1	strip2	swath4	pen7	chick38
insecticide3	low	unsprayed	week1	strip2	swath4	pen7	chick39
insecticide3	low	unsprayed	week1	strip2	swath4	pen7	chick40
insecticide3	low	unsprayed	week1	strip2	swath4	pen7	chick41
insecticide3	low	unsprayed	week1	strip2	swath4	pen7	chick42
insecticide3	low	sprayed	week1	strip2	swath4	pen8	chick43
insecticide3	low	sprayed	week1	strip2	swath4	pen8	chick44
insecticide3	low	sprayed	week1	strip2	swath4	pen8	chick45
insecticide3	low	sprayed	week1	strip2	swath4	pen8	chick46
insecticide3	low	sprayed	week1	strip2	swath4	pen8	chick47
insecticide3	low	sprayed	week1	strip2	swath4	pen8	chick48
insecticide1	high	sprayed	week1	strip3	swath5	pen9	chick49
insecticide1	high	sprayed	week1	strip3	swath5	pen9	chick50
insecticide1	high	sprayed	week1	strip3	swath5	pen9	chick51
insecticide1	high	sprayed	week1	strip3	swath5	pen9	chick52
insecticide1	high	sprayed	week1	strip3	swath5	pen9	chick53
insecticide1	high	sprayed	week1	strip3	swath5	pen9	chick54
insecticide1	high	unsprayed	week1	strip3	swath5	pen10	chick55
insecticide1	high	unsprayed	week1	strip3	swath5	pen10	chick56
insecticide1	high	unsprayed	week1	strip3	swath5	pen10	chick57
insecticide1	high	unsprayed	week1	strip3	swath5	pen10	chick58
insecticide1	high	unsprayed	week1	strip3	swath5	pen10	chick59
insecticide1	high	unsprayed	week1	strip3	swath5	pen10	chick60
insecticide1	low	unsprayed	week1	strip3	swath6	pen11	chick61
insecticide1	low	unsprayed	week1	strip3	swath6	pen11	chick62
insecticide1	low	unsprayed	week1	strip3	swath6	pen11	chick63
insecticide1	low	unsprayed	week1	strip3	swath6	pen11	chick64

insecticide	dose_level	food_type	week	strip	swath	pen	chick
insecticide1	low	unsprayed	week1	strip3	swath6	pen11	chick65
insecticide1	low	unsprayed	week1	strip3	swath6	pen11	chick66
insecticide1	low	sprayed	week1	strip3	swath6	pen12	chick67
insecticide1	low	sprayed	week1	strip3	swath6	pen12	chick68
insecticide1	low	sprayed	week1	strip3	swath6	pen12	chick69
insecticide1	low	sprayed	week1	strip3	swath6	pen12	chick70
insecticide1	low	sprayed	week1	strip3	swath6	pen12	chick71
insecticide1	low	sprayed	week1	strip3	swath6	pen12	chick72
insecticide3	low	unsprayed	week2	strip4	swath7	pen13	chick73
insecticide3	low	unsprayed	week2	strip4	swath7	pen13	chick74
insecticide3	low	unsprayed	week2	strip4	swath7	pen13	chick75
insecticide3	low	unsprayed	week2	strip4	swath7	pen13	chick76
insecticide3	low	unsprayed	week2	strip4	swath7	pen13	chick77
insecticide3	low	unsprayed	week2	strip4	swath7	pen13	chick78
insecticide3	low	sprayed	week2	strip4	swath7	pen14	chick79
insecticide3	low	sprayed	week2	strip4	swath7	pen14	chick80
insecticide3	low	sprayed	week2	strip4	swath7	pen14	chick81
insecticide3	low	sprayed	week2	strip4	swath7	pen14	chick82
insecticide3	low	sprayed	week2	strip4	swath7	pen14	chick83
insecticide3	low	sprayed	week2	strip4	swath7	pen14	chick84
insecticide3	high	sprayed	week2	strip4	swath8	pen15	chick85
insecticide3	high	sprayed	week2	strip4	swath8	pen15	chick86
insecticide3	high	sprayed	week2	strip4	swath8	pen15	chick87
insecticide3	high	sprayed	week2	strip4	swath8	pen15	chick88
insecticide3	high	sprayed	week2	strip4	swath8	pen15	chick89
insecticide3	high	sprayed	week2	strip4	swath8	pen15	chick90
insecticide3	high	unsprayed	week2	strip4	swath8	pen16	chick91
insecticide3	high	unsprayed	week2	strip4	swath8	pen16	chick92
insecticide3	high	unsprayed	week2	strip4	swath8	pen16	chick93
insecticide3	high	unsprayed	week2	strip4	swath8	pen16	chick94
insecticide3	high	unsprayed	week2	strip4	swath8	pen16	chick95
insecticide3	high	unsprayed	week2	strip4	swath8	pen16	chick96
insecticide1	high	sprayed	week2	strip5	swath9	pen17	chick97
insecticide1	high	sprayed	week2	strip5	swath9	pen17	chick98
insecticide1	high	sprayed	week2	strip5	swath9	pen17	chick99
insecticide1	high	sprayed	week2	strip5	swath9	pen17	chick100
insecticide1	high	sprayed	week2	strip5	swath9	pen17	chick101
insecticide1	high	sprayed	week2	strip5	swath9	pen17	chick102
insecticide1	high	unsprayed	week2	strip5	swath9	pen18	chick103
insecticide1	high	unsprayed	week2	strip5	swath9	pen18	chick104
insecticide1	high	unsprayed	week2	strip5	swath9	pen18	chick105

insecticide	dose_level	food_type	week	strip	swath	pen	chick
insecticide1	high	unsprayed	week2	strip5	swath9	pen18	chick106
insecticide1	high	unsprayed	week2	strip5	swath9	pen18	chick107
insecticide1	high	unsprayed	week2	strip5	swath9	pen18	chick108
insecticide1	low	unsprayed	week2	strip5	swath10	pen19	chick109
insecticide1	low	unsprayed	week2	strip5	swath10	pen19	chick110
insecticide1	low	unsprayed	week2	strip5	swath10	pen19	chick111
insecticide1	low	unsprayed	week2	strip5	swath10	pen19	chick112
insecticide1	low	unsprayed	week2	strip5	swath10	pen19	chick113
insecticide1	low	unsprayed	week2	strip5	swath10	pen19	chick114
insecticide1	low	sprayed	week2	strip5	swath10	pen20	chick115
insecticide1	low	sprayed	week2	strip5	swath10	pen20	chick116
insecticide1	low	sprayed	week2	strip5	swath10	pen20	chick117
insecticide1	low	sprayed	week2	strip5	swath10	pen20	chick118
insecticide1	low	sprayed	week2	strip5	swath10	pen20	chick119
insecticide1	low	sprayed	week2	strip5	swath10	pen20	chick120
insecticide2	low	unsprayed	week2	strip6	swath11	pen21	chick121
insecticide2	low	unsprayed	week2	strip6	swath11	pen21	chick122
insecticide2	low	unsprayed	week2	strip6	swath11	pen21	chick123
insecticide2	low	unsprayed	week2	strip6	swath11	pen21	chick124
insecticide2	low	unsprayed	week2	strip6	swath11	pen21	chick125
insecticide2	low	unsprayed	week2	strip6	swath11	pen21	chick126
insecticide2	low	sprayed	week2	strip6	swath11	pen22	chick127
insecticide2	low	sprayed	week2	strip6	swath11	pen22	chick128
insecticide2	low	sprayed	week2	strip6	swath11	pen22	chick129
insecticide2	low	sprayed	week2	strip6	swath11	pen22	chick130
insecticide2	low	sprayed	week2	strip6	swath11	pen22	chick131
insecticide2	low	sprayed	week2	strip6	swath11	pen22	chick132
insecticide2	high	sprayed	week2	strip6	swath12	pen23	chick133
insecticide2	high	sprayed	week2	strip6	swath12	pen23	chick134
insecticide2	high	sprayed	week2	strip6	swath12	pen23	chick135
insecticide2	high	sprayed	week2	strip6	swath12	pen23	chick136
insecticide2	high	sprayed	week2	strip6	swath12	pen23	chick137
insecticide2	high	sprayed	week2	strip6	swath12	pen23	chick138
insecticide2	high	unsprayed	week2	strip6	swath12	pen24	chick139
insecticide2	high	unsprayed	week2	strip6	swath12	pen24	chick140
insecticide2	high	unsprayed	week2	strip6	swath12	pen24	chick141
insecticide2	high	unsprayed	week2	strip6	swath12	pen24	chick142
insecticide2	high	unsprayed	week2	strip6	swath12	pen24	chick143
insecticide2	high	unsprayed	week2	strip6	swath12	pen24	chick144
insecticide3	high	unsprayed	week3	strip7	swath13	pen25	chick145
insecticide3	high	unsprayed	week3	strip7	swath13	pen25	chick146

insecticide	dose_level	food_type	week	strip	swath	pen	chick
insecticide3	high	unsprayed	week3	strip7	swath13	pen25	chick147
insecticide3	high	unsprayed	week3	strip7	swath13	pen25	chick148
insecticide3	high	unsprayed	week3	strip7	swath13	pen25	chick149
insecticide3	high	unsprayed	week3	strip7	swath13	pen25	chick150
insecticide3	high	sprayed	week3	strip7	swath13	pen26	chick151
insecticide3	high	sprayed	week3	strip7	swath13	pen26	chick152
insecticide3	high	sprayed	week3	strip7	swath13	pen26	chick153
insecticide3	high	sprayed	week3	strip7	swath13	pen26	chick154
insecticide3	high	sprayed	week3	strip7	swath13	pen26	chick155
insecticide3	high	sprayed	week3	strip7	swath13	pen26	chick156
insecticide3	low	unsprayed	week3	strip7	swath14	pen27	chick157
insecticide3	low	unsprayed	week3	strip7	swath14	pen27	chick158
insecticide3	low	unsprayed	week3	strip7	swath14	pen27	chick159
insecticide3	low	unsprayed	week3	strip7	swath14	pen27	chick160
insecticide3	low	unsprayed	week3	strip7	swath14	pen27	chick161
insecticide3	low	unsprayed	week3	strip7	swath14	pen27	chick162
insecticide3	low	sprayed	week3	strip7	swath14	pen28	chick163
insecticide3	low	sprayed	week3	strip7	swath14	pen28	chick164
insecticide3	low	sprayed	week3	strip7	swath14	pen28	chick165
insecticide3	low	sprayed	week3	strip7	swath14	pen28	chick166
insecticide3	low	sprayed	week3	strip7	swath14	pen28	chick167
insecticide3	low	sprayed	week3	strip7	swath14	pen28	chick168
insecticide2	low	unsprayed	week3	strip8	swath15	pen29	chick169
insecticide2	low	unsprayed	week3	strip8	swath15	pen29	chick170
insecticide2	low	unsprayed	week3	strip8	swath15	pen29	chick171
insecticide2	low	unsprayed	week3	strip8	swath15	pen29	chick172
insecticide2	low	unsprayed	week3	strip8	swath15	pen29	chick173
insecticide2	low	unsprayed	week3	strip8	swath15	pen29	chick174
insecticide2	low	sprayed	week3	strip8	swath15	pen30	chick175
insecticide2	low	sprayed	week3	strip8	swath15	pen30	chick176
insecticide2	low	sprayed	week3	strip8	swath15	pen30	chick177
insecticide2	low	sprayed	week3	strip8	swath15	pen30	chick178
insecticide2	low	sprayed	week3	strip8	swath15	pen30	chick179
insecticide2	low	sprayed	week3	strip8	swath15	pen30	chick180
insecticide2	high	sprayed	week3	strip8	swath16	pen31	chick181
insecticide2	high	sprayed	week3	strip8	swath16	pen31	chick182
insecticide2	high	sprayed	week3	strip8	swath16	pen31	chick183
insecticide2	high	sprayed	week3	strip8	swath16	pen31	chick184
insecticide2	high	sprayed	week3	strip8	swath16	pen31	chick185
insecticide2	high	sprayed	week3	strip8	swath16	pen31	chick186
insecticide2	high	unsprayed	week3	strip8	swath16	pen32	chick187

insecticide	dose_level	food_type	week	strip	swath	pen	chick
insecticide2	high	unsprayed	week3	strip8	swath16	pen32	chick188
insecticide2	high	unsprayed	week3	strip8	swath16	pen32	chick189
insecticide2	high	unsprayed	week3	strip8	swath16	pen32	chick190
insecticide2	high	unsprayed	week3	strip8	swath16	pen32	chick191
insecticide2	high	unsprayed	week3	strip8	swath16	pen32	chick192
insecticide1	high	sprayed	week3	strip9	swath17	pen33	chick193
insecticide1	high	sprayed	week3	strip9	swath17	pen33	chick194
insecticide1	high	sprayed	week3	strip9	swath17	pen33	chick195
insecticide1	high	sprayed	week3	strip9	swath17	pen33	chick196
insecticide1	high	sprayed	week3	strip9	swath17	pen33	chick197
insecticide1	high	sprayed	week3	strip9	swath17	pen33	chick198
insecticide1	high	unsprayed	week3	strip9	swath17	pen34	chick199
insecticide1	high	unsprayed	week3	strip9	swath17	pen34	chick200
insecticide1	high	unsprayed	week3	strip9	swath17	pen34	chick201
insecticide1	high	unsprayed	week3	strip9	swath17	pen34	chick202
insecticide1	high	unsprayed	week3	strip9	swath17	pen34	chick203
insecticide1	high	unsprayed	week3	strip9	swath17	pen34	chick204
insecticide1	low	sprayed	week3	strip9	swath18	pen35	chick205
insecticide1	low	sprayed	week3	strip9	swath18	pen35	chick206
insecticide1	low	sprayed	week3	strip9	swath18	pen35	chick207
insecticide1	low	sprayed	week3	strip9	swath18	pen35	chick208
insecticide1	low	sprayed	week3	strip9	swath18	pen35	chick209
insecticide1	low	sprayed	week3	strip9	swath18	pen35	chick210
insecticide1	low	unsprayed	week3	strip9	swath18	pen36	chick211
insecticide1	low	unsprayed	week3	strip9	swath18	pen36	chick212
insecticide1	low	unsprayed	week3	strip9	swath18	pen36	chick213
insecticide1	low	unsprayed	week3	strip9	swath18	pen36	chick214
insecticide1	low	unsprayed	week3	strip9	swath18	pen36	chick215
insecticide1	low	unsprayed	week3	strip9	swath18	pen36	chick216

Unbalanced Factorial Design

Here we consider the first four motion sickness experiments reported in Burns (1984).

```
des3 <- design("Motion sickness incidence") %>%
  set_units(experiment = 4,
            subject = nested_in(experiment,
                                1 ~ 21,
                                2 ~ 20,
```

```
6                               3 ~ 29,
7                               4 ~ 59)) %>%
8     set_trts(frequency    = c(0.167, 0.250),
9              acceleration = c(0.111, 0.222)) %>%
10    allot_trts(frequency:acceleration ~ experiment) %>%
11    assign_trts(order = "systematic") %>%
12    serve_table()
```

Table 3: Design table output for the unbalanced factorial design.

experiment	subject	frequency	acceleration
experiment1	subject1	0.167	0.111
experiment1	subject2	0.167	0.111
experiment1	subject3	0.167	0.111
experiment1	subject4	0.167	0.111
experiment1	subject5	0.167	0.111
experiment1	subject6	0.167	0.111
experiment1	subject7	0.167	0.111
experiment1	subject8	0.167	0.111
experiment1	subject9	0.167	0.111
experiment1	subject10	0.167	0.111
experiment1	subject11	0.167	0.111
experiment1	subject12	0.167	0.111
experiment1	subject13	0.167	0.111
experiment1	subject14	0.167	0.111
experiment1	subject15	0.167	0.111
experiment1	subject16	0.167	0.111
experiment1	subject17	0.167	0.111
experiment1	subject18	0.167	0.111
experiment1	subject19	0.167	0.111
experiment1	subject20	0.167	0.111
experiment1	subject21	0.167	0.111
experiment2	subject22	0.25	0.111
experiment2	subject23	0.25	0.111
experiment2	subject24	0.25	0.111
experiment2	subject25	0.25	0.111
experiment2	subject26	0.25	0.111
experiment2	subject27	0.25	0.111
experiment2	subject28	0.25	0.111
experiment2	subject29	0.25	0.111
experiment2	subject30	0.25	0.111

experiment	subject	frequency	acceleration
experiment2	subject31	0.25	0.111
experiment2	subject32	0.25	0.111
experiment2	subject33	0.25	0.111
experiment2	subject34	0.25	0.111
experiment2	subject35	0.25	0.111
experiment2	subject36	0.25	0.111
experiment2	subject37	0.25	0.111
experiment2	subject38	0.25	0.111
experiment2	subject39	0.25	0.111
experiment2	subject40	0.25	0.111
experiment2	subject41	0.25	0.111
experiment3	subject42	0.167	0.222
experiment3	subject43	0.167	0.222
experiment3	subject44	0.167	0.222
experiment3	subject45	0.167	0.222
experiment3	subject46	0.167	0.222
experiment3	subject47	0.167	0.222
experiment3	subject48	0.167	0.222
experiment3	subject49	0.167	0.222
experiment3	subject50	0.167	0.222
experiment3	subject51	0.167	0.222
experiment3	subject52	0.167	0.222
experiment3	subject53	0.167	0.222
experiment3	subject54	0.167	0.222
experiment3	subject55	0.167	0.222
experiment3	subject56	0.167	0.222
experiment3	subject57	0.167	0.222
experiment3	subject58	0.167	0.222
experiment3	subject59	0.167	0.222
experiment3	subject60	0.167	0.222
experiment3	subject61	0.167	0.222
experiment3	subject62	0.167	0.222
experiment3	subject63	0.167	0.222
experiment3	subject64	0.167	0.222
experiment3	subject65	0.167	0.222
experiment3	subject66	0.167	0.222
experiment3	subject67	0.167	0.222
experiment3	subject68	0.167	0.222
experiment3	subject69	0.167	0.222
experiment3	subject70	0.167	0.222
experiment4	subject71	0.25	0.222

experiment	subject	frequency	acceleration
experiment4	subject72	0.25	0.222
experiment4	subject73	0.25	0.222
experiment4	subject74	0.25	0.222
experiment4	subject75	0.25	0.222
experiment4	subject76	0.25	0.222
experiment4	subject77	0.25	0.222
experiment4	subject78	0.25	0.222
experiment4	subject79	0.25	0.222
experiment4	subject80	0.25	0.222
experiment4	subject81	0.25	0.222
experiment4	subject82	0.25	0.222
experiment4	subject83	0.25	0.222
experiment4	subject84	0.25	0.222
experiment4	subject85	0.25	0.222
experiment4	subject86	0.25	0.222
experiment4	subject87	0.25	0.222
experiment4	subject88	0.25	0.222
experiment4	subject89	0.25	0.222
experiment4	subject90	0.25	0.222
experiment4	subject91	0.25	0.222
experiment4	subject92	0.25	0.222
experiment4	subject93	0.25	0.222
experiment4	subject94	0.25	0.222
experiment4	subject95	0.25	0.222
experiment4	subject96	0.25	0.222
experiment4	subject97	0.25	0.222
experiment4	subject98	0.25	0.222
experiment4	subject99	0.25	0.222
experiment4	subject100	0.25	0.222
experiment4	subject101	0.25	0.222
experiment4	subject102	0.25	0.222
experiment4	subject103	0.25	0.222
experiment4	subject104	0.25	0.222
experiment4	subject105	0.25	0.222
experiment4	subject106	0.25	0.222
experiment4	subject107	0.25	0.222
experiment4	subject108	0.25	0.222
experiment4	subject109	0.25	0.222
experiment4	subject110	0.25	0.222
experiment4	subject111	0.25	0.222
experiment4	subject112	0.25	0.222

experiment	subject	frequency	acceleration
experiment4	subject113	0.25	0.222
experiment4	subject114	0.25	0.222
experiment4	subject115	0.25	0.222
experiment4	subject116	0.25	0.222
experiment4	subject117	0.25	0.222
experiment4	subject118	0.25	0.222
experiment4	subject119	0.25	0.222
experiment4	subject120	0.25	0.222
experiment4	subject121	0.25	0.222
experiment4	subject122	0.25	0.222
experiment4	subject123	0.25	0.222
experiment4	subject124	0.25	0.222
experiment4	subject125	0.25	0.222
experiment4	subject126	0.25	0.222
experiment4	subject127	0.25	0.222
experiment4	subject128	0.25	0.222
experiment4	subject129	0.25	0.222

Acknowledgement

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