STATISTICS UNIT

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A COMPUTER PROGRAM FOR GENERATING RANDOMISATION FOR α DESIGNS

G. Swaminathan

ICRISAT

International Crops Research Institute for the Semi-Arid Tropics

ICRISAT Patancheru P.O. Andhra Pradesh 502 324, India

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C O N T E N T S

INTRODUCTION

Coordinated Variety Trial (CVT) statistical package is widely used for generating unrandomised, randomised field plans and analysis of the data from the experiments in a-designs. These type of designs were developed by Patterson and Williams (1976). Brief introduction to the functions of various statements have been given in Statistics Unit Report No. 6/84 and the detailed descriptions of the statements are given in the CVT user s manual. An appropriate generating array is used as an input to get the field plan. An algorithm (ALPHA) for constructing efficient a lattice designs has been developed at the A.F.R.C. Unit of Statistics, Edinburgh University, U.K.. Constraints placed on the size of the designs are the following.

$$2 \le r \le 20 \ ;$$

$$2 \le k \le 20 \ ,$$

$$r \le 50 \ ,$$

$$k < v \ ;$$

$$5 \le v \le k \ ,$$

where r is the number of replications, v is the number of varieties, k is the number of plots per block. In this report a sample session with the program ALPHA is given for 24 entries in 6 blocks each of size 4 in 3 replications and for 40 entries in 8 blocks each of size 5 in 4 replications. An example is given to illustrate how generating array is used to generate the randomised field plans.

Note : The listing of the algorithm ALPHA is available with Statistics Unit.

SAMPLE SESSION WITH PROGRAM ALPHA

The user s response to the prompts are underlined.

Example 1 :

This is an example for a α-design for 24 varieties in 6 blocks each of size 4 per replicate and in 3 replications. This output will come on the terminal screen. The user will copy the values of generating array on a paper for the subsequent use of these array values for generating the unrandomised and randomised field plans. The harmonic mean efficiency factor should also be noted for analysing the corresponding α-design.

```
$ RUN DB1:[SWAMI.FOR]ALPHA



 THIS ALGORITHM GENERATES EFFICIENT ALPHA(0,1) DESIGNS


 GIVE THE SIZE OF THE DESIGN


 HOW MANY VARIETIES?
24
 HOW MANY REPLICATES?
3
 HOW MANY PLOTS IN EACH BLOCK?
4


 GENERATING ARRAY (R BY K):

    0    0    0    0
    0    1    3    6
    0    4    5    3


 HARMONIC MEAN EFFICIENCY FACTOR:  0.7107692


 UPPER BOUND:                      0.7272727


 DO YOU WANT A BETTER DESIGN OF THIS SIZE (YES OR NO)?
YES

 GENERATING ARRAY (R BY K):

    0    0    0    0
```

```
   0   1   3   6
   0   4   2   1

 HARMONIC MEAN EFFICIENCY FACTOR:  0.71597082

 UPPER BOUND:                      0.72727273


 DO YOU WANT A BETTER DESIGN OF THIS SIZE (YES OR NO)?
YES

 GENERATING ARRAY (R BY K):

   0   0   0   0
   0   1   3   6
   0   4   1   5

 HARMONIC MEAN EFFICIENCY FACTOR:  0.71597082

 UPPER BOUND:                      0.72727273


 DO YOU WANT A BETTER DESIGN OF THIS SIZE (YES OR NO)?
YES

 GENERATING ARRAY (R BY K):

   0   0   0   0
   0   1   3   6
   0   3   4   5

 HARMONIC MEAN EFFICIENCY FACTOR:  0.71597082

 UPPER BOUND:                      0.72727273


 DO YOU WANT A BETTER DESIGN OF THIS SIZE (YES OR NO)?
YES

 GENERATING ARRAY (R BY K):

   0   0   0   0
   0   1   3   6
   0   3   2   4
```

HARMONIC MEAN EFFICIENCY FACTOR: 0.71895759

UPPER BOUND: 0.72727273

DO YOU WANT A BETTER DESIGN OF THIS SIZE (YES OR NO)?
YES

GENERATING ARRAY (R BY K):

0	0	0	0
0	1	3	6
0	5	1	2

HARMONIC MEAN EFFICIENCY FACTOR: 0.71895759

UPPER BOUND: 0.72727273

DO YOU WANT A BETTER DESIGN OF THIS SIZE (YES OR NO)?
NO

HAVE YOU FINISHED USING THE ALGORITHM (YES OR NO)?
YES

Example 2:

The following output will appear on the terminal screen for a α-design of 40 varieties in 8 blocks each of size 5 per replicate and in 4 replications.

```
 THIS ALGORITHM GENERATES EFFICIENT ALPHA(0,1) DESIGNS

 GIVE THE SIZE OF THE DESIGN


 HOW MANY VARIETIES?
40
 HOW MANY REPLICATES?
4
 HOW MANY PLOTS IN EACH BLOCK?
5

 GENERATING ARRAY (R BY K):

    0   0   0   0   0
    0   1   3   4   5
    0   2   7   6   3
    0   5   6   2   4

 HARMONIC MEAN EFFICIENCY FACTOR:  0.79047696

 UPPER BOUND:                      0.79375848


 DO YOU WANT A BETTER DESIGN OF THIS SIZE (YES OR NO)?
YES

 GENERATING ARRAY (R BY K):

    0   0   0   0   0
    0   1   3   4   5
    0   7   4   6   2
    0   4   5   2   1

HARMONIC MEAN EFFICIENCY FACTOR:  0.79047696

UPPER BOUND:                      0.79375848
```

DO YOU WANT A BETTER DESIGN OF THIS SIZE (YES OR NO
YES

GENERATING ARRAY (R BY K

0	0	0	0	0
0	1	3	4	2
0	4	2	1	3
0	2	4	3	1

HARMONIC MEAN EFFICIENCY FACTOR: .79047696

UPPER BOUND: .79375848

DO YOU WANT A BETTER DESIGN OF THIS SIZE (YES OR NO
NO

HAVE YOU FINISHED USING THE ALGORITHM (YES OR NO)?
YES

EXAMPLE OF A CVT PROGRAM FOR GENRATING UNRANSOMISED AND RANSOMISED FIELD PLANS

The necessary steps for running a CVT program has been illustrated in Statistics Unit Report No. 6/84. The following CVT program generates both unrandomised and randomised field plans for a e-design of 24 varieties in 6 blocks of size 4 in 3 replicatons.

```
+DATA BASE
XXXX
+READ
   8
  10    1    1
  11    1   14
  12    1    1          1
  13    1    1          1
  14    1    1          1
  20    1    2
  50         21
  51    1    21
+HEADING
   1
  69
  HARMONIC MEAN EFFICIENCY FACTOR    2.896754
+GENERATE
   1
   2   10    3   .1
  11   13   .4
  15   16   .7
+RANDOMISE PLAN
   3    2   20
  15   16   17
  17   18
  18   19
  19    0
+HEADING
   2
  21
                    RANDOMISED PLAN
  22
   R     B                  TREATMENTS
+PRINT
   5
  21
  22
  50    0    0    0    1         2    3
  51    0    0    1    1         1
  17    0    0    0    0         3    4
+EXECUTE
84
0 3 28 7 4 0    0 1 1 5  0 5 1 1
3 7 28
973 157
1 1 1 1 1 1 1 2 2 2 2 2 2 3 3   3   4 4
```

```
1 2 3 4 5 6 7 1 2 3 4 5 6 7 1 2 3 4 5 6 7
+STOP
```

The output will appear on the terminal screen as follows.

Note: The commands to get the randomised and unrandomised plan on the line printer are given in the Statistics Unit Report 6/84

```
1CVT 2.8  +++ A PROGRAM WRITTEN AT ARC UNIT OF STATISTICS, EDINBUR
+++

------------------------------------------------------------ ----------

0+DATA BASE
0XXXX
0+READ
      8
0  VTE  TYP UNTS  OBS  S/P   MV UTER VTER      (CLASS)
    10    1    1    1    0    *          /          0
    11    1   14    1    0    *          /          0
    12    1    1    1    1    *          /          0
    13    1    1    1    1    *          /          0
    14    1    1    1    1    *          /          0
    20    1    2    1    0    *          /          0
    50    1   21    1    0    *          /          0
    51    1   21    1    0    *          /          0
0+HEADING
0   1
0  69
   HARMONIC MEAN EFFICIENCY FACTOR:  0.71895759
0+GENERATE
    1
0   2  10   3  11
   12  13  14
   15  16  17
0+RANDOMISE PLAN
    3   3  20
   15  16  17
   17  16
   16  15
   15   0
0+HEADING
0   2
0  21
                    RANDOMISED PLAN
0  22
    R    B                TREATMENTS
0+PRINT
     5    0    0    0
   VTE STEP CYCL +STE  S/P  V/N  DIR   NA CHAR  DEC  NCA  NLD FWID

    21    0    0    0    0    0    0    0    0    0    0    0    0
    22    0    0    0    0    0    0    0    0    0    2    0    0
    50    0    0    0    1    0    2    .    0    3    2    3    3
    51    0    0    1    1    0    2    1    0    3    2    0    3
```

```
    17    0    0    0    0    0    3    4    0    3    5    0    5
0+EXECUTE
 84
 0 3 28 7 4 0   0 1 3 6  0 5 1 2
 3 7 28
 973 157
 1 1 1 1 1 1 1 2 2 2 2 2 2 2 3 3 3 3 3 3 3
 1 2 3 4 5 6 7 1 2 3 4 5 6 7 1 2 3 4 5 6 7
0DATA SET READ
```

UNRANDOMISED PLAN

R	B	TREATMENT LEVELS			
1	1	1	8	15	22
1	2	2	9	16	23
1	3	3	10	17	24
1	4	4	11	18	25
1	5	5	12	19	26
1	6	6	13	20	27
1	7	7	14	21	28
2	1	1	9	18	28
2	2	2	10	19	22
2	3	3	11	20	23
2	4	4	12	21	24
2	5	5	13	15	25
2	6	6	14	16	26
2	7	7	8	17	27
3	1	1	13	16	24
3	2	2	14	17	25
3	3	3	8	18	26
3	4	4	9	19	27
3	5	5	10	20	28
3	6	6	11	21	22
3	7	7	12	15	23

RANDOMISED PLAN

R	B	TREATMENTS			
1	1	11	18	4	25
1	2	27	13	6	20
1	3	23	9	16	2
1	4	19	5	12	26
1	5	7	14	21	28
1	6	22	15	8	1
1	7	17	10	3	24
2	1	6	16	14	26
2	2	3	20	23	1
2	3	25	13	5	15
2	4	17	7	27	8
2	5	19	2	10	22

```
    2   6        21    4   12   24
    2   7         1    9   18   28
    3   1        26   18    8    3
    3   2        20   10    5   28
    3   3        27    9   19    4
    3   4        22   21   11    6
    3   5        23   15    7   12
    3   6        24   13   16    1
    3   7        17    2   14   25
 +STOP
0PROGRAM RUN COMPLETED
```

Note: The procedure for using CVT commands for the analysis of α-designs is given in the Statistics Unit Report NO. 6/84.

REFERENCE

CVT program User's maual, ARC unit of statistics University of Edinburgh.

An algorithim for constructing α-lattice designs, A.F.R.C. Unit of Statistics, Edinburgh University.

Patternson,H.D. and Williams,E.R. (1976). A new class of resolvable incomplete block designs. Biometrika 63(1), 83-92.

Swaminathan,G. and Gilliver,B. (1984). Co-ordinated Varietal Testing computing program. Statistics Unit Report No.6/84, 1-26.