

NOTE

A Programme to Carry out Analysis of Variance- Two-way Classification on MICRO 2200

Studies on fishing gear and fish processing require statistical computations at some stage or the other. Analysis of variance has found wide application in this regard (Pillai *et al.* 1979; Thampuran *et al.* 1981 and Nair, 1982). For the calculation involving this technique much time and effort can be considerably saved by employing ready made programmes on micro computers. Hindustan Computers Limited (1977) supplies about 20 useful programmes in a cyclostyled manual entitled "Software Application for MICRO 2200". This does not include a programme on analysis of variance (ANOVA) for the general case. On request, the author received programme steps for ANOVA of two treatments from Shri Saminathan, Hindustan Computers Ltd. The present programme gives ANOVA for

the general case, that is, for p -treatments, p , varying between 2 and 83 on MICRO 2200 of Hindustan Computers. It is possible to use this programme on other micro computers featuring conversational language and having corresponding keys equivalent to those given in the programme steps.

The formulae used to compute the various sums of squares relevant to ANOVA of two-way classification are those given by Snedecor & Cochran (1968).

The programme accepts $n \times p$ data, and was written specially for randomised block designs with 'p' treatments and 'n' blocks. 274 programme steps, $(17 + p)$ data registers, 3 index registers and 2 labels were used for the programme.

The programme: Analysis of variance – two way classification

Step No.	Key	Step No.	Key	Step No.	Key
0000	HLT	0026	SPACE	0051	O
0001	=	0027	O	0052	1
0002	A	0028	STX	0053	MEM
0003	9	0029	1	0054	0
0004	PRINT	(DL01)		0055	9
0005	—	0030	HLT		
0006	1	0031	MFN	0056	8
0007	=	0032	0	0057	X
0008	B	0033	9	0058	=
0009	9	0034	8	0059	MFN
0010	STX	0035	PRINT	0060	0
0011	0	0036	MFN	0061	9
0012	HLT	0037	IND	0062	5
0013	PRINT	0038	1	0063	0
0014	=	0039	X	0064	=
0015	A	0040	=	0065	A
0016	6	0041	MFN	0066	8
0017	—	0042	0	0067	A
0018	1	0043	9	0068	9
0019	=	0044	7	0069	—
0020	B	0045	INX	0070	1
0021	7	0046	1	0071	=
0022	STX	0047	DEX	0072	STX
0023	2	0048	0	0073	0
0024	SLV	0049	GTO	0074	0
0025	8	0050	L	0075	STX

Step No.	Key	Step No.	Key	Step No.	Key
0076	1	0129	SLV	0183	÷
0077	DEX	0130	8	0184	B
0078	2	0131	SPACE	0185	9
0079	GTO	0132	A	0186	=
0080	L	0133	4	0187	B
0081	0	0134	X	0188	6
0082	1	0135	=	0189	PRINT
0083	SLV	0136	÷	0190	SLV
0084	8	0137	A	0191	8
0085	SPACE	0138	9	0192	A
0086	SLV	0139	÷	0193	5
0087	8	0140	A	0194	÷
0088	SLV	0141	6	0195	A
0089	8	0142	=	0196	9
0090	0	0143	A	0197	—
0091	STX	0144	2	0198	A
0092	1	0145	—	0199	2
0093	A	0146	A	0200	=
0094	9	0147	7	0201	B
0095	—	0148	EX	0202	8
0096	1	0149	=	0203	PRINT
0097	=	0150	A	0204	B
0098	STX	0151	1	0205	7
0099	0	0152	PRINT	0206	PRINT
(DL02)		0153	A	0207	B
0100	MEM	0154	9	0208	8
0101	IND	0155	X	0209	÷
0102	1	0156	A	0210	B
0103	MFN	0157	6	0211	7
0104	0	0158	—	0212	=
0105	9	0159	1	0213	B
0106	4	0160	=	0214	5
0107	X	0161	PRINT	0215	PRINT
0108	=	0162	SLV	0216	SLV
0109	MFN	0163	8	0217	8
0110	0	0164	MEM	0218	A
0111	9	0165	0	0219	1
0112	3	0166	9	0220	—
0113	MEM	0167	3	0221	A
0114	IND	0168	÷	0222	0
0115	1	0169	A	0223	—
0116	÷	0170	6	0224	B
0117	A	0171	—	0225	8
0118	6	0172	A	0226	=
0119	=	0173	2	0227	B
0120	PRINT	0174	=	0228	4
0121	INX	0175	A	0229	PRINT
0122	1	0176	0	0230	B
0123	DEX	0177	PRINT	0231	9
0124	0	0178	B	0232	X
0125	GTO	0179	9	0233	B
0126	L	0180	PRINT	0234	7
0127	0	0181	A	0235	=
0128	2	0182	0	0236	PRINT

Step No.	Key	Step No.	Key	Step No.	Key
0237	÷	0250	B	0263	PRINT
0238	B	0251	6	0264	SLV
0239	4	0252	EX	0265	8
0240	EX	0253	=	0266	SLV
0241	=	0254	PRINT	0267	8
0242	B	0255	MEM	0268	GOLD
0243	3	0256	0	0269	4
0244	PRINT	0257	8	0270	GTO
0245	SLV	0258	5	0271	0
0246	8	0259	÷	0272	0
0247	SLV	0260	B	0273	0
0248	8	0261	3		
0249	÷	0262	=		

To run the programme, feed, p-value, that is the number of treatments (gears) at step No. 0000, (when the display is 0001), n-value (the number of blocks or days) at step No. 0012 (when the display is 0013), the data X_{ij} in the order $X_{11}, X_{12}, \dots, X_{1p}, X_{21}, X_{22}, \dots, X_{2p}, \dots, X_{n1}, \dots, X_{np}$ at Step No. 0030 (when the display is 0031). The print out is in the order: the p-treatment means (mean catches); the total sum of squares, its degrees of freedom (d.f.); the treatment sum of squares, its d.f. followed by the mean sum of squares (m.s.); the block sum of squares, its d.f. followed by the m.s., the error sum of squares, its d.f. followed by the m.s. and lastly the two F-values. The first F-value is for testing the difference among the treatment means and the second, for testing the difference among blocks.

If logarithmic transformation of the data is required as in the case of fish catch, insert

the keys 'INV' and '10*' between steps 0030 and 0031.

The author is thankful to Dr. C. C. Panduranga Rao, Director and Dr. P. N. Kaul, Scientist S-3 of Central Institute of Fisheries Technology, Cochin-682 029 for encouragement.

References

- Hindustan Computers Ltd. (1977) MICRO 2200 Application Software pp. 1.1 to 20.3, Hindustan Computers Ltd.
- Nair, A. K. K. (1982) *Fish. Technol.* **19**
- Thampuran, N., Iyer, H. K. & Iyer, K. M. (1981) *Fish. Technol.* **18**, 95
- Pillai, N. S., George, N. A. & Nair, A. K. K. (1979) *Fish. Technol.* **16**, 65
- Snedecor, G. W. & Cochran, W. G. (1968) *Statistical Methods*, 6th ed., The Iowa State University Press, U. S. A.