The cube data

March 18, 2011

The data:

```
a   0   .   .   .   .   .  .  .
b   1   0   .   .   .   .  .  .
c   1   1   0   .   .   .  .  .
d 1.4   1   1   0   .   .  .  .
e   1 1.4 1.4 1.7   0   .  .  .
f 1.4   1 1.7 1.4   1   0  .  .
g 1.4 1.7   1 1.4   1 1.4  0  .
h 1.7 1.4 1.4   1 1.4   1  1  0
```

The SAS code and output:

```
options linesize=70 pagesize=25;

data cube(type=distance);
  infile "cube.dat";
  input corner $ a b c d e f g h;

proc mds level=absolute out=coords outres=res;

proc print data=res;

proc plot data=coords;
  plot dim2*dim1 $ _label_;

proc mds data=cube dim=3 level=absolute outres=res;

proc print data=res;
```

```
Multidimensional Scaling:  Data=WORK.CUBE.DATA
Shape=TRIANGLE Condition=MATRIX Level=ABSOLUTE
Coef=IDENTITY Dimension=2 Formula=1 Fit=1
```

Gconverge=0.01 Maxiter=100 Over=1 Ridge=0.0001

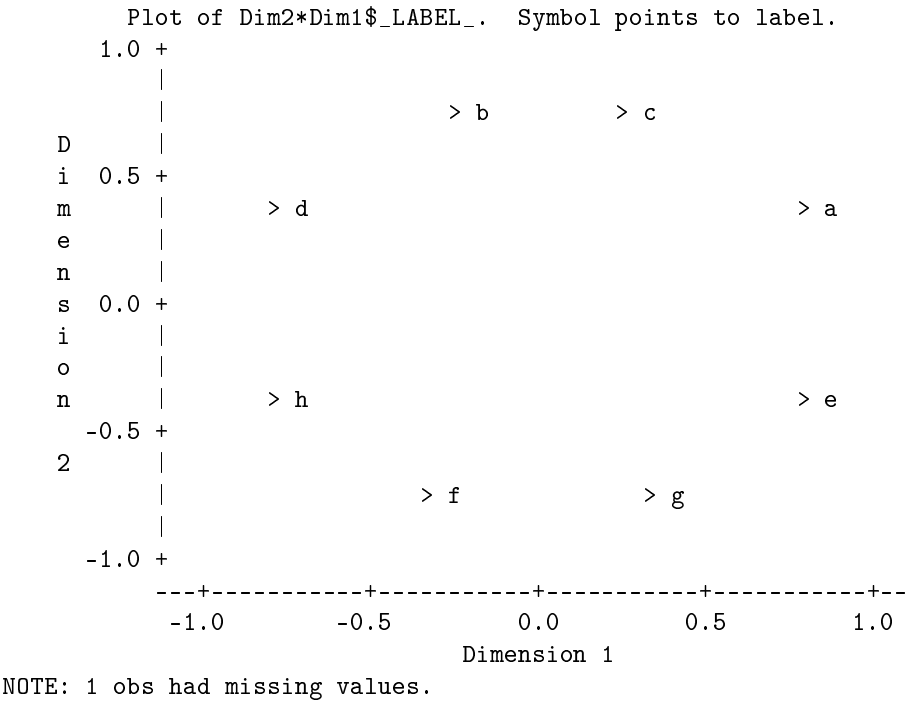
Iteration	Type	Badness-of-Fit Criterion	Change in Criterion	Convergence Measure
0	Initial	0.2987	.	0.6106
1	Lev-Mar	0.2275	0.0711	0.1308
2	Gau-New	0.2251	0.002446	0.0409
3	Gau-New	0.2248	0.000263	0.0164
4	Gau-New	0.2248	0.0000426	0.006667

Convergence criterion is satisfied.

Obs	_DIM_	_MAT_	_RHO_	_COL_	DATA	DISTANCE	FIT	FITTED	WEIGHT	RESIDUAL
1	2	1	b	a	1.0	1.06911	1.0	1.06911	0.021683	-0.06911
2	2	1	c	a	1.0	0.59201	1.0	0.59201	0.021683	0.40799
3	2	1	c	b	1.0	0.50747	1.0	0.50747	0.021683	0.49253
4	2	1	d	a	1.4	1.56173	1.4	1.56173	0.021683	-0.16173
5	2	1	d	b	1.0	0.59201	1.0	0.59201	0.021683	0.40799
6	2	1	d	c	1.0	1.06912	1.0	1.06912	0.021683	-0.06912
7	2	1	e	a	1.0	0.83153	1.0	0.83153	0.021683	0.16847
8	2	1	e	b	1.4	1.51258	1.4	1.51258	0.021683	-0.11258
9	2	1	e	c	1.4	1.22180	1.4	1.22180	0.021683	0.17820
10	2	1	e	d	1.7	1.77157	1.7	1.77157	0.021683	-0.07157
11	2	1	f	a	1.4	1.59688	1.4	1.59688	0.021683	-0.19688
12	2	1	f	b	1.0	1.40661	1.0	1.40661	0.021683	-0.40661
13	2	1	f	c	1.7	1.52540	1.7	1.52540	0.021683	0.17460
14	2	1	f	d	1.4	1.21583	1.4	1.21583	0.021683	0.18417
15	2	1	f	e	1.0	1.16655	1.0	1.16655	0.021683	-0.16655
16	2	1	g	a	1.4	1.21578	1.4	1.21578	0.021683	0.18422

Obs	_DIM_	_MAT_	_RHO_	_COL_	DATA	DISTANCE	FIT	FITTED	WEIGHT	RESIDUAL

s	_	_	_	_	A	E	A	T	T	L
17	2	1	g	b	1.7	1.52534	1.7	1.52534	0.021683	0.17466
18	2	1	g	c	1.0	1.40656	1.0	1.40656	0.021683	-0.40656
19	2	1	g	d	1.4	1.59683	1.4	1.59683	0.021683	-0.19683
20	2	1	g	e	1.0	0.53433	1.0	0.53433	0.021683	0.46567
21	2	1	g	f	1.4	0.68626	1.4	0.68626	0.021683	0.71374
22	2	1	h	a	1.7	1.77156	1.7	1.77156	0.021683	-0.07156
23	2	1	h	b	1.4	1.22177	1.4	1.22177	0.021683	0.17823
24	2	1	h	c	1.4	1.51257	1.4	1.51257	0.021683	-0.11257
25	2	1	h	d	1.0	0.83152	1.0	0.83152	0.021683	0.16848
26	2	1	h	e	1.4	1.56686	1.4	1.56686	0.021683	-0.16686
27	2	1	h	f	1.0	0.53435	1.0	0.53435	0.021683	0.46565
28	2	1	h	g	1.0	1.16652	1.0	1.16652	0.021683	-0.16652



NOTE: 1 obs had missing values.

Multidimensional Scaling: Data=WORK.CUBE.DATA
Shape=TRIANGLE Condition=MATRIX Level=ABSOLUTE
Coef=IDENTITY Dimension=3 Formula=1 Fit=1
Gconverge=0.01 Maxiter=100 Over=1 Ridge=0.0001

Iteration	Type	Badness-of-Fit Criterion	Change in Criterion	Convergence Measure

0	Initial	0.0422	.	0.5786
1	Lev-Mar	0.0342	0.008058	0.0249
2	Gau-New	0.0342	0.0000110	0.001358

Convergence criterion is satisfied.

Obs	_DIM_	_MAT_	_RIX_	_WOR_	_COL_	DATA	DISTANCE	FIT	FIT	WEIGHT	RESIDUAL
1	3	1	b	a	1.0	0.93677	1.0	0.93677	0.021683	0.06323
2	3	1	c	a	1.0	0.93677	1.0	0.93677	0.021683	0.06323
3	3	1	c	b	1.0	1.12235	1.0	1.12235	0.021683	-0.12235
4	3	1	d	a	1.4	1.48503	1.4	1.48503	0.021683	-0.08503
5	3	1	d	b	1.0	0.93677	1.0	0.93677	0.021683	0.06323
6	3	1	d	c	1.0	0.93677	1.0	0.93677	0.021683	0.06323
7	3	1	e	a	1.0	0.98013	1.0	0.98013	0.021683	0.01987
8	3	1	e	b	1.4	1.40121	1.4	1.40121	0.021683	-0.00121
9	3	1	e	c	1.4	1.40121	1.4	1.40121	0.021683	-0.00121
10	3	1	e	d	1.7	1.73212	1.7	1.73212	0.021683	-0.03212
11	3	1	f	a	1.4	1.39034	1.4	1.39034	0.021683	0.00966
12	3	1	f	b	1.0	1.04580	1.0	1.04580	0.021683	-0.04580
13	3	1	f	c	1.7	1.64813	1.7	1.64813	0.021683	0.05187
14	3	1	f	d	1.4	1.39034	1.4	1.39034	0.021683	0.00966
15	3	1	f	e	1.0	0.99839	1.0	0.99839	0.021683	0.00161
16	3	1	g	a	1.4	1.39034	1.4	1.39034	0.021683	0.00966

Obs	_DIM_	_MAT_	_RIX_	_WOR_	_COL_	DATA	DISTANCE	FIT	FIT	WEIGHT	RESIDUAL
17	3	1	g	b	1.7	1.64813	1.7	1.64813	0.021683	0.051873
18	3	1	g	c	1.0	1.04580	1.0	1.04580	0.021683	-0.045797
19	3	1	g	d	1.4	1.39034	1.4	1.39034	0.021683	0.009661
20	3	1	g	e	1.0	0.99839	1.0	0.99839	0.021683	0.001610
21	3	1	g	f	1.4	1.44574	1.4	1.44574	0.021683	-0.045742
22	3	1	h	a	1.7	1.73212	1.7	1.73212	0.021683	-0.032116
23	3	1	h	b	1.4	1.40121	1.4	1.40121	0.021683	-0.001206

24	3	1	h	c	1.4	1.40121	1.4	1.40121	0.021683	-0.001206
25	3	1	h	d	1.0	0.98013	1.0	0.98013	0.021683	0.019873
26	3	1	h	e	1.4	1.37343	1.4	1.37343	0.021683	0.026573
27	3	1	h	f	1.0	0.99839	1.0	0.99839	0.021683	0.001610
28	3	1	h	g	1.0	0.99839	1.0	0.99839	0.021683	0.001610