General equations for morphological metrics used

OLD (ordered linear direction) metric

$$\frac{\sum_{i=1}^{L-1} diff(sgn(\Delta(M_i,M_{i+1})), sgn(\Delta(N_i,N_{i+1})))}{L\text{-}1}$$

OCD (ordered combinatorial direction) metric

$$\frac{\sum_{j=1}^{L-1}\sum_{i=1}^{L-j} diff\left(sgn\left(\Delta(M_iM_j),-\Delta(N_iN_j)\right)\right)}{L_m}$$

UCD (unordered combinatorial direction) metric

$$\frac{\sum_{v=(-1,0,1)} |\#_vM - \#_vN|}{(L_m * 2)}$$

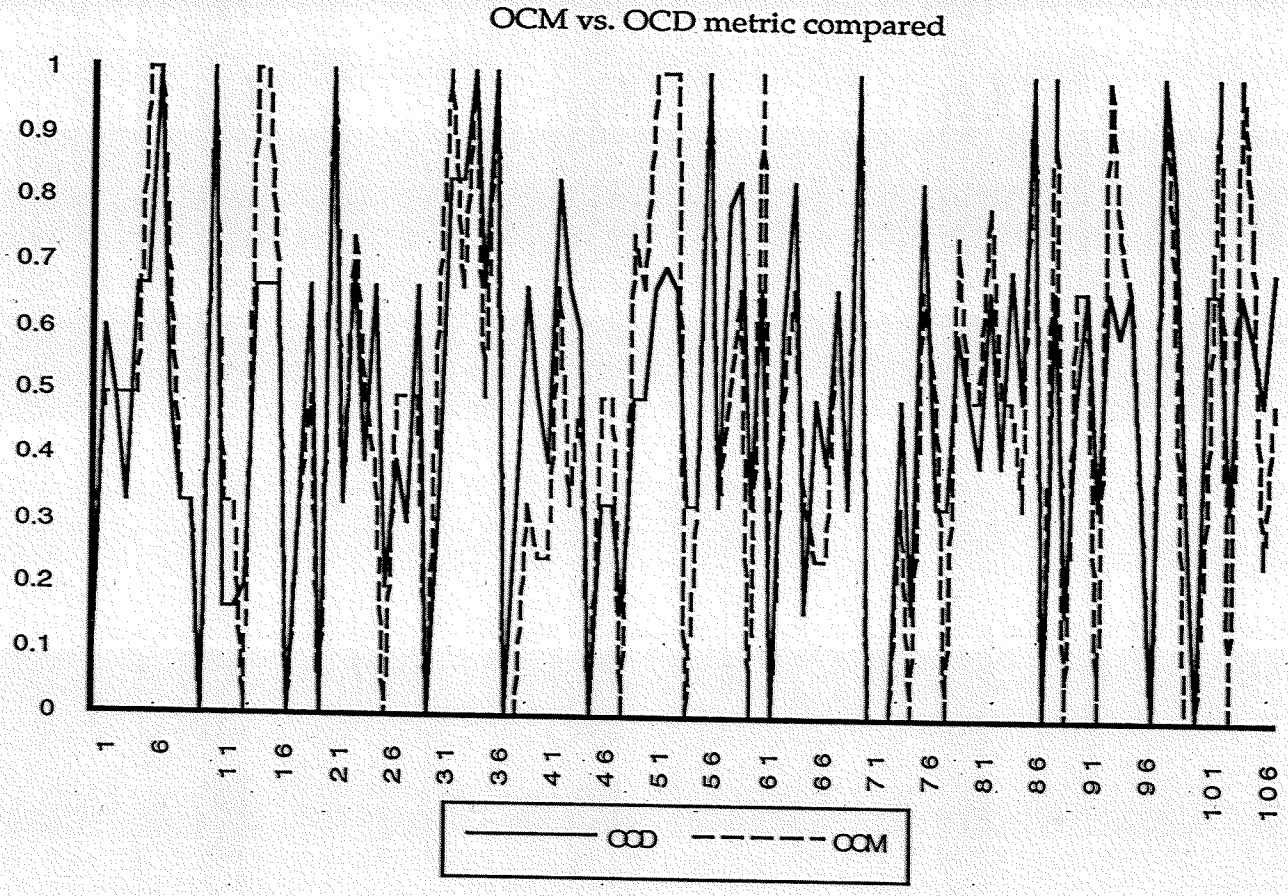
OCM (ordered combinatorial magnitude) metric

$$\frac{\sum_{j=1}^{L-1}\sum_{i=1}^{L-j} |\Delta(M_iM_j),-\Delta(N_iN_j)|}{L_m}$$

— L_m is the 2nd order binomial coefficient of the length of the morphs, or number of non-redundant pairwise relationships.
— Δ is some arbitrary interval function (like absolute value of pitch distance).
— *sign* is the standard up, down, equal contour function.
— *diff* is the statiscal difference between the "contour vectors" of the two morphologies, i.e the number of ups, downs, and equals (in the unordered metric), or the differences between corresponding cells (in the ordered one).

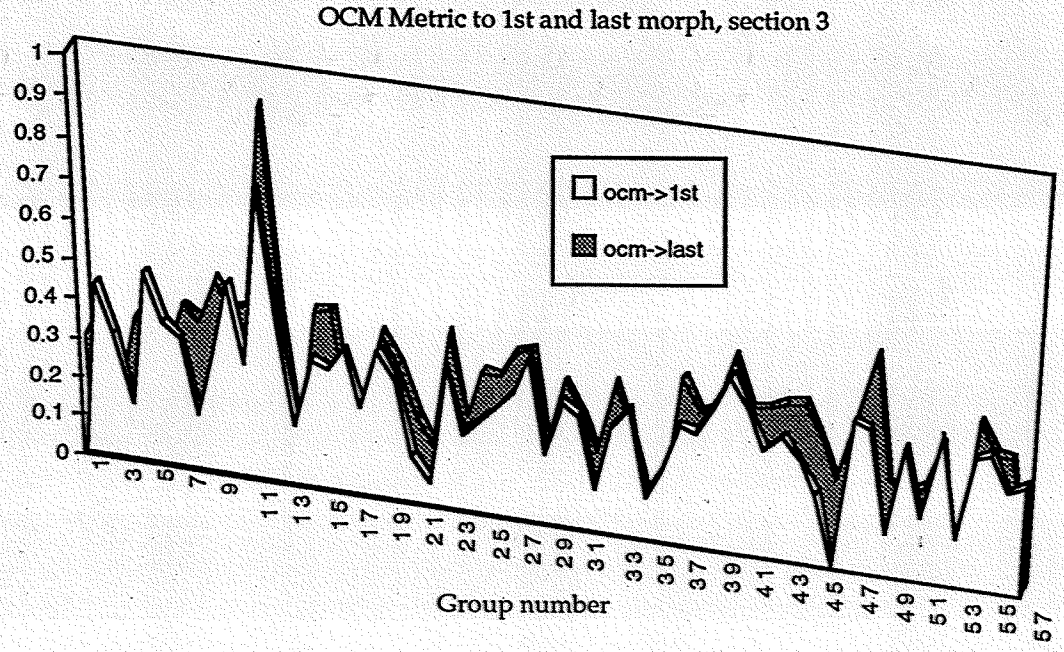
These are highly generalized versions of metrics, without scaling or weighting functions. These metric equations can take a great many forms, depending on the scaling and weighting functions used, ways that length differences are handled, and in types of interval function. In the examples in this talk, all length differences are truncated to the smaller morph (the simplest of about five possible algorithms for this).

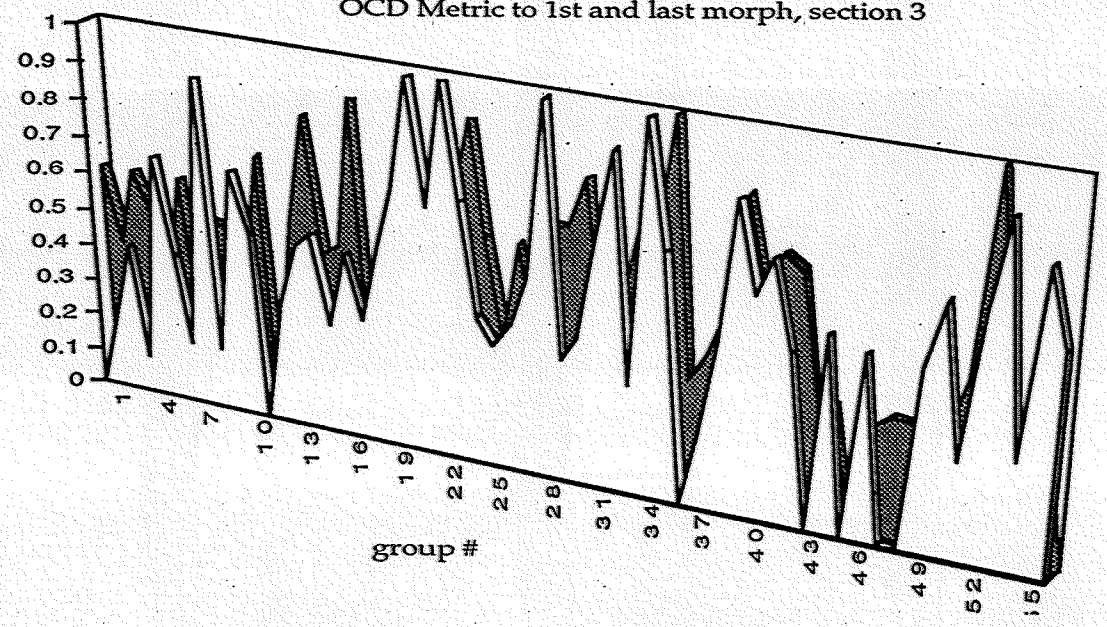
OCD and OCM metrics compared, adjacent groups, entire piece (directional vs. magnitude)



OCM much greater spread. OCD is more even between adjacent groups. That is, magnitude changes more than contour?

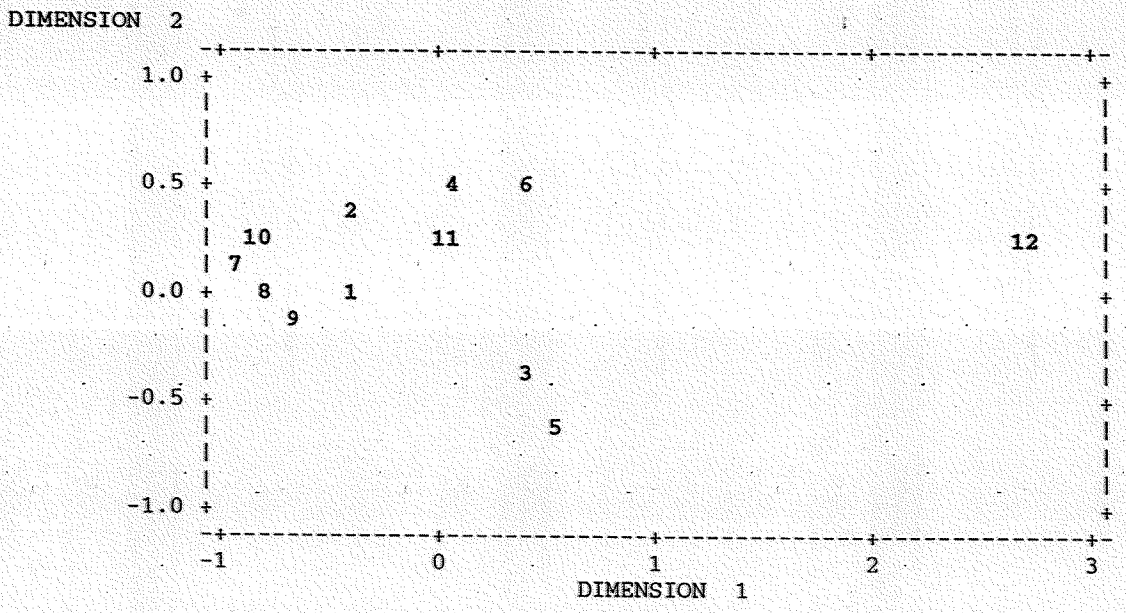
"2d" Metric comparisons, section 3





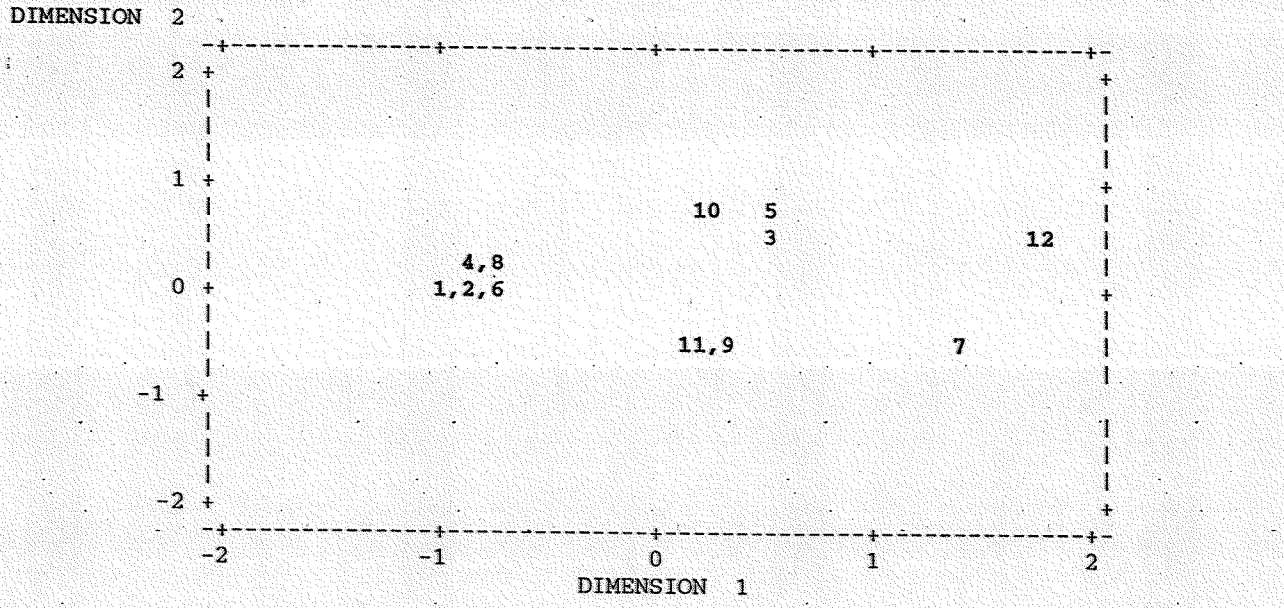
Multidimensional scaling coordinates in 2 Dimensions: OCM Metric (section 1)

Group	Plot	Dimension 1	Dimension 2
Group1	1	-0.42	-0.08
Group2	2	-0.40	0.25
Group3	3	0.37	-0.48
Group4	4	0.08	0.41
Group5	5	0.55	-0.70
Group6	6	0.39	0.39
Group7	7	-0.91	0.04
Group8	8	-0.83	-0.11
Group9	9	-0.65	-0.22
Group10	10	-0.85	0.14
Group11	11	0.01	0.22
Group12	12	2.67	0.14



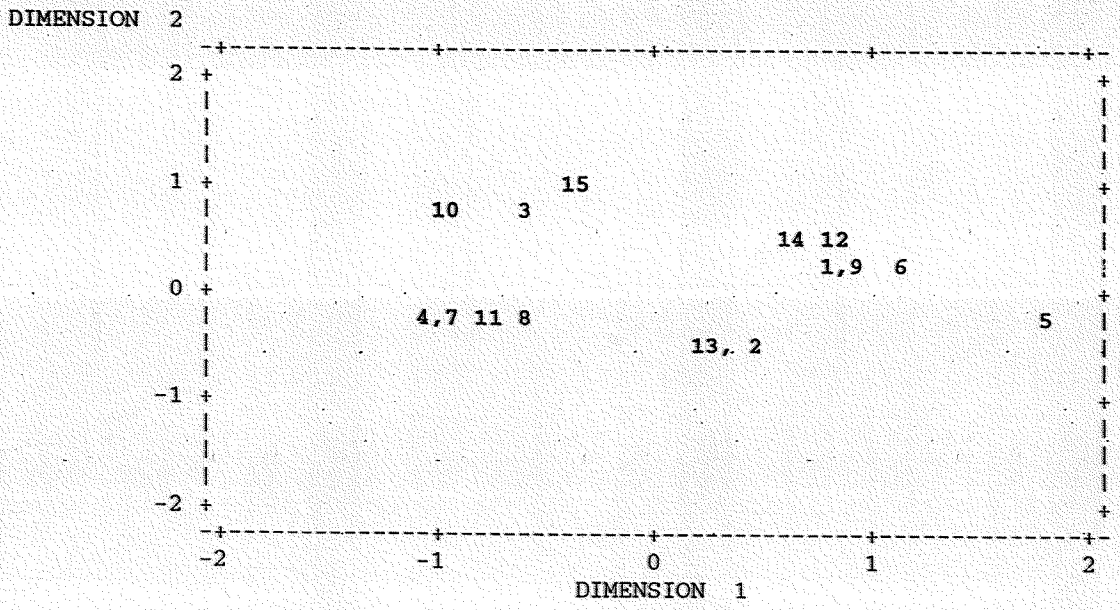
Multidimensional scaling coordinates in 2 Dimensions: OCD Metric (section 1)

Group	Plot	Dimension 1	Dimension 2
Group1	1	-0.94	-0.07
Group2	2	-0.97	-0.06
Group3	3	0.52	0.48
Group4	4	-0.88	0.12
Group5	5	0.45	0.68
Group6	6	-0.96	-0.22
Group7	7	1.33	-0.73
Group8	8	-0.83	0.21
Group9	9	0.19	-0.60
Group10	10	0.18	0.50
Group11	11	0.15	-0.59
Group12	12	1.75	0.27



Multidimensional scaling coordinates in 2 Dimensions: OCD Metric (section 2), unity scaling

Group	Plot	Dimension 1	Dimension 2
Group1	1	0.82	0.02
Group2	2	0.17	-0.61
Group3	3	-0.62	0.74
Group4	4	-1.05	-0.25
Group5	5	1.67	-0.31
Group6	6	1.00	0.08
Group7	7	-1.05	-0.25
Group8	8	-0.87	-0.46
Group9	9	0.78	0.18
Group10	10	-1.02	0.50
Group11	11	-1.03	-0.41
Group12	12	0.78	0.31
Group13	13	0.22	-0.75
Group14	14	0.61	0.41
Group15	15	-0.40	0.80



Multidimensional scaling coordinates in 2 Dimensions: OCD Metric (section 5), unity scaling

Group	Plot	Dimension 1	Dimension 2
Group1	1	1.80	-0.16
Group2	2	-1.13	-0.20
Group3	3	0.65	0.21
Group4	4	0.32	-0.43
Group5	5	0.33	-0.48
Group6	6	0.87	0.82
Group7	7	-0.91	0.63
Group8	8	-0.95	0.10
Group9	9	0.12	-0.79
Group10	10	-0.69	0.31
Group11	11	0.60	0.29
Group12	12	-1.00	-0.31