Correlations between slope 1 and slope 2

Background (refresher)

Our research is concerned with diversity rate-of-change measurement. The technique used was to fit two-piecewise linear approximations to diversity data, and then use the slope (gradient) of the first line as a measure.

Current investigations are concerned with the potential uses of the slope of the second line. Initial results seemed to indicate that the second line's slope is more or less inversely related to that of the first: relatively steep slopes in the first line appeared to go with relatively shallow slopes in the second.

This investigation

In this investigation, correlations between the slopes of the first and seconds lines were calculated. The process was as follows:

1. I gathered the same data used in the ANTS paper (well, I re-ran the simulations). For each combination of all functions and all algorithms, 30 samples were run and diversity measurements captured at every 10th iteration.
2. For each simulation - that is, every single sample - PWLAs were fit and the values of slope 1 and slope 2 were taken.
3. Pearson correlation coefficients were calculated[1] for each function/algorithm pair, using the slope 1 value of each sample as one population, and the slope 2 value of each sample as the other. This gave us a matrix of coefficients, with one coefficient per algorithm/population pair.
4. Means and standard deviations were calculated for each row and for each column of the resulting matrix (from above), as well as for the entire matrix.

Results

Results are shown in the table below. Cells show the Pearson correlation coefficient for each function/algorithm pair, with functions running along rows, and algorithms running along columns. Additional rows show the mean and standard deviation of each column, and vice versa. The final two rows show the mean and SD over the entire matrix (except special rows and columns).

[1] using the R command: cor(X, Y, method="pearson")

	bb	bba	gbest	gbestgc	lbest	lbestgc	spso	vn	vngc	mean	sd
ackley	0.48670	0.56015	0.24538	0.41440	0.40758	0.18603	0.85492	0.62307	0.63709	0.49059	0.20682
alpine	-0.01576	-0.19237	-0.00527	0.49902	0.20492	0.12368	0.74216	0.05835	-0.28060	0.12602	0.32280
eggholder	-0.30103	-0.09276	-0.22869	-0.00274	0.20038	-0.11913	0.07932	0.53990	0.59209	0.07415	0.31716
elliptic	0.64326	0.55005	0.57984	0.46662	0.02615	0.41176	0.52751	0.44587	0.70999	0.48456	0.19636
goldsteinprice	0.61803	-0.08340	0.62439	0.62352	0.44097	0.40229	0.75762	0.66165	0.50245	0.50528	0.24756
griewank	0.57536	0.61179	0.76468	0.63806	0.25806	0.26737	0.54976	0.44390	0.46727	0.50847	0.16807
levy	0.33433	0.58281	0.59083	0.55499	0.77175	0.82698	0.21613	0.77209	0.86079	0.61230	0.22294
michalewicz	-0.05967	0.20428	-0.25211	0.26353	0.35757	0.30763	0.30591	-0.17521	0.33107	0.14256	0.23764
quadric	0.09128	0.33025	0.46707	0.61488	0.58096	0.50560	0.40271	0.36077	0.42528	0.41987	0.15548
quartic	0.59923	0.51032	0.69886	0.76671	0.32145	0.74891	0.27072	0.62766	0.59265	0.57072	0.17568
rastrigin	0.11484	0.15493	0.27005	0.42228	0.31705	0.47901	0.51045	-0.24959	0.01108	0.22557	0.24583
rosenbrock	0.46765	0.12137	0.15560	0.37022	0.01957	0.42114	0.42253	-0.12480	0.42051	0.25264	0.21475
salomon	0.50651	0.43767	0.45838	0.55614	0.34998	0.26112	0.65020	-0.10353	0.15397	0.36338	0.23102
schwefel1_2	0.40695	0.36448	0.28099	0.61536	0.65639	0.44829	0.45576	0.51172	0.00475	0.41608	0.19346
schwefel2_22	0.69975	0.42737	0.59003	0.62760	0.71450	0.60149	0.68066	0.63620	0.59909	0.61963	0.08520
schwefel2_26	0.15512	-0.21509	0.53891	0.53174	-0.05489	-0.16369	0.70168	-0.12427	-0.31417	0.11726	0.38014
sixhump	-0.28545	-0.17001	-0.07261	0.09834	0.33956	-0.35844	0.74833	0.19215	-0.05825	0.04818	0.34433
spherical	0.38639	0.34146	0.58157	0.55265	0.46191	0.35711	0.46616	0.64975	0.56065	0.48418	0.10859
step	0.40833	0.33345	0.44724	0.25216	0.47614	0.54686	0.65579	0.62592	0.35079	0.45519	0.13576
zakharov	0.60261	0.65581	0.73230	0.43723	0.23240	0.29553	0.71119	0.34293	0.76572	0.53063	0.20541
mean	0.32172	0.27163	0.37337	0.46514	0.35412	0.32748	0.53548	0.33573	0.36661		
sd	0.30742	0.28994	0.31279	0.19202	0.22283	0.29237	0.20799	0.33659	0.33951		

Over all values:

mean	0.37236
sd	0.28674