Online Resource 1 for: Redundancy-Triggered Relocation: Decentralized Coordination of Local Searchers for Static and Dynamic Multimodal Optimization

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Abstract

Per-problem results on the CEC 2022 suite (organisers' instances and our instance draws), the CEC 2013 comparison by problem, and the sensitivity study.

CEC 2022 suite: organisers' instances

CEC 2022 suite: our instance draws

CEC 2013 niching suite

Sensitivity to the settings

Table S1 CEC 2022 suite, organisers' instances, RTR versus the same searchers without relocation: mean peak ratio at accuracy 10^{-4} (30 runs per problem), difference of means with 95% bootstrap confidence interval, Vargha–Delaney A_{12}, and the verdict of the Holm-corrected Mann–Whitney test. P8 and P9 are the same instance.

problem	RTR	no relocation	difference [95% CI]	A_{12}	verdict
P1	0.753	0.442	+0.311 [+0.252, +0.368]	0.92	better
P2	0.999	0.992	+0.007 [−0.002, +0.024]	0.37	worse
P3	0.995	0.842	+0.154 [+0.111, +0.195]	0.76	better
P4	1.000	0.992	+0.008 [−0.000, +0.025]	0.50	n.s.
P5	0.572	0.391	+0.181 [+0.145, +0.215]	0.94	better
P6	0.283	0.265	+0.018 [+0.010, +0.025]	0.81	better
P7	0.657	0.465	+0.192 [+0.154, +0.230]	0.93	better
P8	0.630	0.482	+0.148 [+0.125, +0.173]	0.98	better
P9	0.630	0.482	+0.148 [+0.125, +0.173]	0.98	better
P10	0.441	0.352	+0.089 [+0.077, +0.100]	1.00	better
P11	0.405	0.325	+0.080 [+0.071, +0.089]	1.00	better
P12	0.406	0.318	+0.088 [+0.080, +0.096]	1.00	better
P13	0.445	0.378	+0.067 [+0.047, +0.089]	0.91	better
P14	0.448	0.365	+0.083 [+0.068, +0.097]	0.99	better
P15	0.436	0.287	+0.149 [+0.131, +0.167]	1.00	better
P16	0.458	0.326	+0.132 [+0.118, +0.146]	1.00	better
P17	0.662	0.350	+0.312 [+0.261, +0.362]	1.00	better
P18	0.969	0.966	+0.003 [−0.000, +0.007]	0.63	n.s.
P19	0.853	0.649	+0.204 [+0.170, +0.235]	0.91	better
P20	0.978	0.685	+0.293 [+0.244, +0.341]	0.95	better
P21	0.399	0.333	+0.065 [+0.044, +0.088]	0.90	better
P22	0.425	0.444	−0.020 [−0.037, −0.002]	0.25	worse
P23	0.664	0.543	+0.122 [+0.085, +0.161]	0.76	better
P24	0.573	0.392	+0.181 [+0.146, +0.216]	0.98	better

Table S2 Mean peak ratio at accuracy 10^{-4} on the CEC 2022 suite, our instance draws, by problem group (30 runs per problem; default HmSO 15 runs).

problems	RTR	no relocation	mQSO	HmSO	HmSO (tuned)	DE
P1–P4 (cones, 5-D)	0.955	0.817	0.730	0.250	0.956	0.097
P5–P8 (compositions, 5-D)	0.524	0.398	0.334	0.131	0.195	0.007
P9–P16 (F8, change modes C1–C8)	0.461	0.344	0.068	0.060	0.028	0.003
P17–P20 (cones, 10-D)	0.953	0.700	0.137	0.245	0.001	0.153
P21–P24 (compositions, 10-D)	0.516	0.429	0.198	0.045	0.055	0.021
all 24	**0.645**	0.505	0.256	0.132	0.210	0.047

Table S3 CEC 2022 suite, our instance draws, RTR versus the same searchers without relocation: mean peak ratio at accuracy 10^{-4} (30 runs per problem), difference of means with 95% bootstrap confidence interval, Vargha–Delaney A_{12}, and the verdict of the Holm-corrected Mann–Whitney test. P8 and P9 are the same problem (Section 4.1 of the paper).

problem	RTR	no relocation	difference [95% CI]	A_{12}	verdict
P1	0.824	0.442	+0.383 [+0.322, +0.440]	1.00	better
P2	0.999	0.992	+0.007 [−0.002, +0.024]	0.37	worse
P3	0.998	0.842	+0.156 [+0.114, +0.198]	0.76	better
P4	1.000	0.992	+0.008 [−0.000, +0.025]	0.50	n.s.
P5	0.552	0.383	+0.169 [+0.133, +0.204]	0.88	better
P6	0.287	0.259	+0.028 [+0.021, +0.034]	0.94	better
P7	0.647	0.475	+0.171 [+0.127, +0.216]	0.85	better
P8	0.611	0.474	+0.137 [+0.117, +0.159]	1.00	better
P9	0.611	0.474	+0.137 [+0.117, +0.159]	1.00	better
P10	0.419	0.339	+0.079 [+0.066, +0.092]	0.98	better
P11	0.443	0.317	+0.126 [+0.117, +0.134]	1.00	better
P12	0.406	0.331	+0.075 [+0.068, +0.082]	1.00	better
P13	0.471	0.311	+0.160 [+0.136, +0.184]	1.00	better
P14	0.450	0.335	+0.115 [+0.093, +0.138]	0.99	better
P15	0.489	0.336	+0.154 [+0.125, +0.179]	0.94	better
P16	0.396	0.309	+0.087 [+0.074, +0.101]	1.00	better
P17	0.828	0.350	+0.478 [+0.424, +0.533]	1.00	better
P18	0.999	1.000	−0.001 [−0.001, −0.000]	0.43	n.s.
P19	0.983	0.758	+0.225 [+0.187, +0.262]	0.90	better
P20	1.000	0.692	+0.308 [+0.258, +0.358]	0.96	better
P21	0.391	0.333	+0.058 [+0.036, +0.081]	0.77	better
P22	0.437	0.447	−0.010 [−0.027, +0.008]	0.30	worse
P23	0.664	0.544	+0.120 [+0.082, +0.162]	0.77	better
P24	0.571	0.393	+0.178 [+0.143, +0.213]	1.00	better

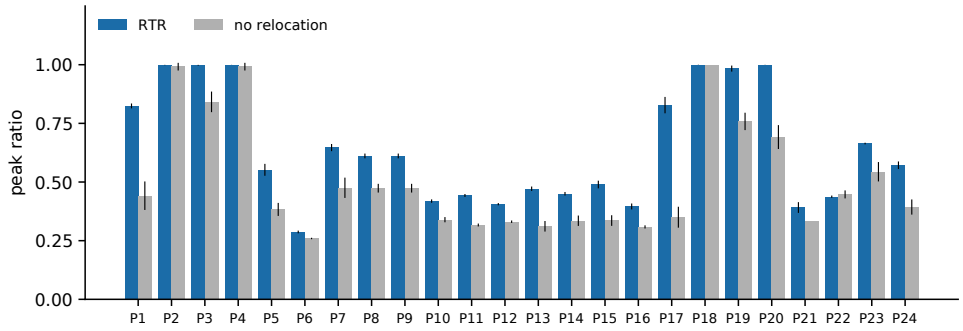


Fig. S1 Mean peak ratio at accuracy 1e-4 on the 24 problems of the CEC 2022 suite, our instance draws (30 runs, 95% confidence intervals): RTR (blue) and the same CMA-ES searchers without relocation (grey).

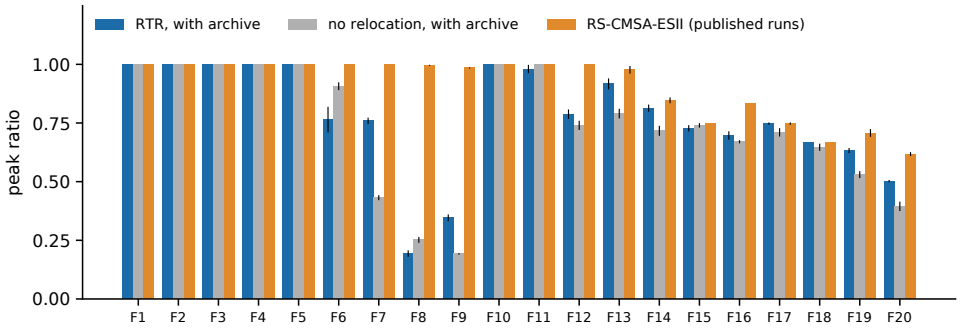


Fig. S2 CEC 2013: mean peak ratio at accuracy 1e-4 (50 runs, 95% confidence intervals) of RTR with archive, the same searchers and archive without relocation, and RS-CMSA-ESII (re-scored published runs).

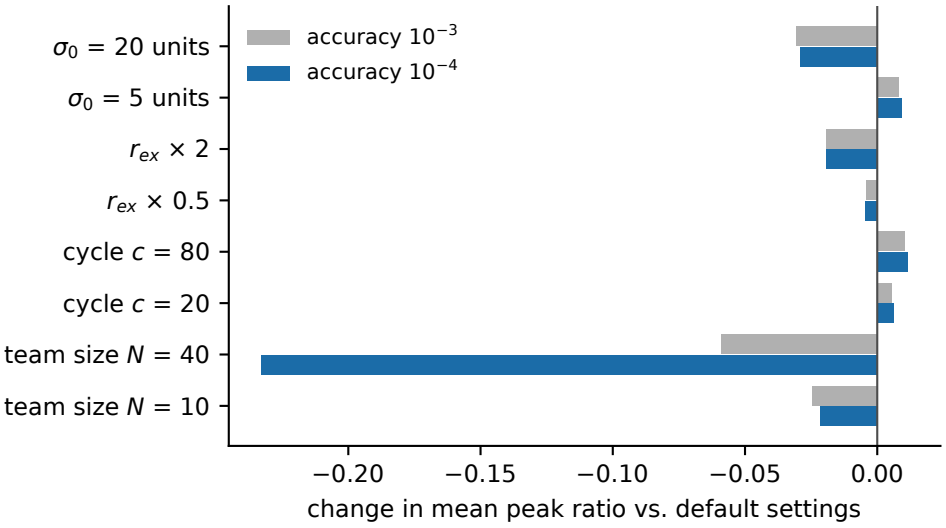


Fig. S3 Sensitivity of RTR on eight problems of the CEC 2022 suite (5 runs per problem): change of the mean peak ratio when one setting is changed from its default, at accuracies 1e-3 (grey) and 1e-4 (blue).