

A New Moving Peaks Benchmark with Attractors for Dynamic Evolutionary Algorithms — Supplementary Material

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This document provides supplementary experimental results for the article “A New Moving Peaks Benchmark with Attractors for Dynamic Evolutionary Algorithms” as follows:

- Table 1 shows the results in terms of the Offline Error assessment measure;
- Table 2 shows the results in terms of the Absolute Recovery Rate assessment measure;
- Table 3 shows the results in terms of the Best Error After Change assessment measure;
- Table 4 shows the results in terms of the Best Distance After Change assessment measure.
- Table 5 compares the effect of Attractor Movement Type (AMT) in the MPBA Benchmark Problem on the performance of compared algorithms.;
- Tables 6 to 21 show the results of the comparison algorithms on the MPBA problem with a varied value of attractor change frequency and a weight of 0 for the attractor location as further indicated below:
 - Tables 6 to 9 show the results in terms of the Offline Error assessment measure;
 - Tables 10 to 13 show the results in terms of the Best Distance After Change assessment measure;
 - Tables 14 to 17 show the results in terms of the Best Error After Change assessment measure;
 - Tables 18 to 21 show the results in terms of the Absolute Recovery Rate assessment measure.

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Algorithm	2 dimensional case with			5 dimensional case with			10 dimensional case with			
	5 peaks	10 peaks	20 peaks	5 peaks	10 peaks	20 peaks	5 peaks	10 peaks	20 peaks	
SGA	Average	11.2891	9.7594	7.9737	82.8096	61.6930	50.7134	170.2053	137.6917	105.7719
	StdDev	5.0832	4.2537	2.9723	2.9723	31.1648	15.0005	9.0964	52.3059	36.2161
	Min	2.2253	3.1310	2.5480	2.5480	42.1348	36.8109	33.3370	93.5802	88.2105
	Max	26.4276	29.6186	17.3182	17.3182	175.6810	119.8620	75.2071	337.3800	271.2670
SOS	Average	3.8354	3.4321	3.1521	3.1521	10.7411	9.0089	7.5561	22.2794	18.6228
	StdDev	1.5992	1.3903	0.9961	0.9961	6.1554	3.3040	2.9500	11.0233	7.7220
	Min	1.1176	1.3942	1.4623	1.4623	2.4446	3.4085	2.3299	8.1878	5.8314
	Max	10.8744	9.5353	6.4137	6.4137	37.3145	18.3635	20.0398	65.9003	31.1438
EIGA	Average	3.2489	3.2299	3.1298	3.1298	12.4432	10.8725	9.1017	34.8165	31.2494
	StdDev	1.1268	0.8319	0.7615	0.7615	5.1198	3.8622	2.3768	15.1667	10.5462
	Min	1.4540	1.6042	1.8506	1.8506	4.2867	4.7717	4.5361	14.8867	15.7512
	Max	7.2740	6.2286	5.5541	5.5541	26.4661	26.9681	21.1626	84.2236	67.6036
MS	Average	3.1804	3.1426	2.4995	2.4995	8.7468	7.9735	7.7472	16.8439	16.3818
	StdDev	1.8830	0.9523	0.7392	0.7392	4.1078	3.7780	2.8678	7.7562	6.2338
	Min	0.9662	1.3341	1.2636	1.2636	2.4314	3.2701	2.9814	4.3143	4.4522
	Max	12.2903	5.8777	4.4836	4.4836	21.8039	31.9690	17.9204	57.1498	45.3700
MIGA	Average	3.4110	2.9774	2.9718	2.9718	9.3492	7.6283	6.9153	17.5809	15.4704
	StdDev	1.7730	1.0772	1.2187	1.2187	3.9360	2.6856	2.2201	9.7881	7.0126
	Min	1.1965	0.8287	1.2491	1.2491	2.0263	3.0446	3.0300	4.5402	6.7789
	Max	11.2136	6.4318	9.0945	9.0945	20.7062	15.0590	13.8020	57.5162	53.7004
DQMOO/AR	Average	2.1200	-2.3209	-5.5496	-5.5496	15.8906	11.8993	7.3735	50.2190	39.7396
	StdDev	3.9420	2.9291	2.6405	2.6405	9.3095	7.7328	4.9463	20.0148	15.2873
	Min	-4.4783	-7.3054	-10.5870	-10.5870	-2.8497	-3.5212	-4.4902	20.3633	16.8023
	Max	11.3924	4.2093	-0.5406	-0.5406	36.8216	31.7892	17.2292	105.0701	79.4788
ROOT	Average	1.2627	-1.5848	-4.4253	-4.4253	17.2266	14.9157	10.7968	77.9439	49.9192
	StdDev	4.0127	2.9525	2.7202	2.7202	7.4101	6.3889	5.6713	27.3978	10.2133
	Min	-7.1238	-8.4234	-11.0052	-11.0052	3.7050	3.4515	-0.6479	43.3048	32.8492
	Max	7.6965	2.2571	1.3928	1.3928	35.8278	30.6286	24.4880	176.6169	73.3879

Table 1: Results from EDO algorithms assessed in terms of the OE performance measure on a varied number of peaks and dimensions on the MMPBA benchmark problem.

Algorithm	2 dimensional case with			5 dimensional case with			10 dimensional case with			
	5 peaks	10 peaks	20 peaks	5 peaks	10 peaks	20 peaks	5 peaks	10 peaks	20 peaks	
SGA	Average	0.5700	0.6720	0.7403	-0.9686	-0.3632	-0.0761	-2.4580	-1.6428	-0.9574
	StdDev	0.1549	0.1066	0.0641	0.7523	0.3341	0.1584	1.0970	0.7111	0.2874
	Min	0.1507	0.3035	0.5110	-3.1777	-1.5626	-0.4691	-5.7156	-4.3832	-2.6601
	Max	0.8287	0.8752	0.8634	0.0468	0.1606	0.2614	-0.9377	-0.7132	-0.5103
SOS	Average	0.9040	0.9210	0.9301	0.7628	0.8153	0.8491	0.5311	0.6392	0.7232
	StdDev	0.0356	0.0273	0.0208	0.1287	0.0603	0.0520	0.2136	0.1436	0.0721
	Min	0.8172	0.8138	0.8604	0.2167	0.6546	0.6176	-0.1640	-0.1070	0.4282
	Max	0.9749	0.9619	0.9656	0.9330	0.9129	0.9451	0.8249	0.8690	0.8668
EIGA	Average	0.9267	0.9306	0.9355	0.7602	0.8043	0.8411	0.3839	0.4757	0.6003
	StdDev	0.0223	0.0155	0.0133	0.0984	0.0673	0.0383	0.2670	0.1723	0.0958
	Min	0.8624	0.8923	0.8954	0.3872	0.5064	0.6415	-0.5207	-0.1229	0.3029
	Max	0.9679	0.9621	0.9577	0.9185	0.9106	0.9104	0.7444	0.7200	0.7875
MS	Average	0.9064	0.9209	0.9387	0.7960	0.8297	0.8423	0.6380	0.6731	0.7611
	StdDev	0.0453	0.0207	0.0156	0.0890	0.0749	0.0537	0.1602	0.1180	0.0537
	Min	0.7250	0.8625	0.9017	0.5262	0.3604	0.6660	-0.1066	0.1624	0.6195
	Max	0.9702	0.9592	0.9649	0.9366	0.9210	0.9373	0.8797	0.8817	0.8610
MIGA	Average	0.9064	0.9264	0.9308	0.7791	0.8328	0.8563	0.6246	0.6913	0.7463
	StdDev	0.0424	0.0232	0.0245	0.0831	0.0559	0.0407	0.2016	0.1355	0.0755
	Min	0.7512	0.8243	0.8280	0.5513	0.6486	0.7194	-0.1378	-0.0208	0.5496
	Max	0.9645	0.9732	0.9695	0.9461	0.9315	0.9249	0.8735	0.8330	0.8784
DQM00/AR	Average	0.7496	0.7388	0.7051	0.6484	0.6153	0.6207	0.5116	0.5092	0.5005
	StdDev	0.0109	0.0093	0.0133	0.0227	0.0100	0.0126	0.0067	0.0104	0.0053
	Min	0.7048	0.7249	0.6779	0.6257	0.5905	0.5909	0.4940	0.4803	0.4920
	Max	0.7612	0.7704	0.7534	0.7000	0.6260	0.6526	0.5256	0.5239	0.5110
ROOT	Average	0.7815	0.7609	0.7253	0.6677	0.6305	0.6001	0.5226	0.4788	0.4609
	StdDev	0.0127	0.0162	0.0150	0.0094	0.0233	0.0204	0.0112	0.0031	0.0042
	Min	0.7396	0.7475	0.6865	0.6555	0.6067	0.5811	0.4757	0.4746	0.4497
	Max	0.8085	0.8147	0.7457	0.6864	0.7247	0.6612	0.5318	0.4896	0.4655

Table 2: Results from EDO algorithms assessed in terms of the ARR performance measure on a varied number of peaks and dimensions on the MMPBA benchmark problem.

Algorithm	2 dimensional case with			5 dimensional case with			10 dimensional case with			
	5 peaks	10 peaks	20 peaks	5 peaks	10 peaks	20 peaks	5 peaks	10 peaks	20 peaks	
SGA	Average	60.1825	47.0718	38.1053	184.0325	129.4451	103.9479	283.8927	227.5340	171.1573
	StdDev	20.6545	13.1699	6.9887	71.4978	30.5949	13.8034	90.1539	62.9753	25.8157
	Min	27.2079	23.6172	25.1305	91.1093	83.3549	76.1320	154.9040	151.6990	132.1690
	Max	122.2350	88.1390	62.8206	400.7170	224.3200	141.8380	597.4270	466.4560	324.8320
SOS	Average	61.0857	46.0720	37.5504	169.1305	123.2417	101.7232	317.1625	218.7726	171.1243
	StdDev	21.8456	9.9348	6.5516	65.5482	24.6313	16.0315	120.8312	58.6138	24.2859
	Min	28.4782	26.2970	26.4111	80.4869	88.1398	77.8536	159.5120	151.5680	130.6430
	Max	133.3120	79.5557	64.9338	400.4580	201.9900	164.5230	682.1000	580.4690	247.4250
EIGA	Average	7.3045	7.1534	6.9715	15.0525	13.2284	11.5373	36.8303	32.4794	25.6872
	StdDev	2.1809	1.6721	1.4916	5.6888	4.2377	2.4159	15.2261	10.0633	6.2119
	Min	3.3182	3.7871	4.2939	5.7389	5.9963	6.7882	16.5906	16.6887	14.0765
	Max	12.9504	11.3465	11.1435	33.2955	30.6660	20.4708	81.0010	67.2696	46.9679
MS	Average	8.4818	8.2395	6.7732	12.6248	11.9486	11.1607	20.3591	19.8014	15.4718
	StdDev	2.8275	1.7885	1.3227	4.5753	4.5392	3.2374	8.3595	7.0475	3.3447
	Min	3.7589	4.3239	4.2477	5.1419	5.8344	5.5169	7.7466	6.8918	8.4898
	Max	20.1088	13.0419	10.7784	25.8656	37.9232	22.9186	64.1524	51.5735	24.0505
MIGA	Average	8.4783	7.7456	7.3761	13.3059	11.2383	10.2082	20.6838	18.1422	15.7833
	StdDev	2.8611	1.9157	1.8176	4.3508	3.0706	2.6076	10.2249	7.2115	4.3676
	Min	3.5306	3.8643	3.9406	3.8629	4.5258	5.8079	6.4846	9.4515	7.2267
	Max	17.3054	12.7211	12.9484	26.8840	19.8449	19.5911	61.5167	54.0299	27.7882
DQM00/AR	Average	18.5221	14.9251	12.4891	82.2260	62.5632	51.9866	159.9424	123.2936	99.9610
	StdDev	0.8592	0.6287	0.3148	21.9516	4.7830	1.5449	6.6995	6.5336	2.1843
	Min	14.6943	12.6557	11.4848	68.2012	41.6343	48.4404	146.1906	113.6061	96.9301
	Max	20.1002	16.0260	12.9657	160.6390	67.9080	55.2722	171.1449	147.0130	107.9896
ROOT	Average	22.5834	18.7962	14.6737	79.7076	67.3594	53.3278	210.2069	128.8814	108.9656
	StdDev	1.1035	0.9239	0.2757	5.2843	3.2560	2.2993	8.9692	4.6734	3.9599
	Min	20.4779	17.0702	14.3591	59.5654	58.4671	45.5220	186.3426	124.0930	94.4804
	Max	27.1228	22.9383	15.4063	85.6360	71.2476	55.7104	221.9443	149.7859	112.3527

Table 3: Results from EDO algorithms assessed in terms of the BEAC performance measure on a varied number of peaks and dimensions on the MMPBA benchmark problem.

Algorithm	2 dimensional case with			5 dimensional case with			10 dimensional case with			
	5 peaks	10 peaks	20 peaks	5 peaks	10 peaks	20 peaks	5 peaks	10 peaks	20 peaks	
SGA	Average	17.4057	17.1107	17.4828	56.7195	56.7473	57.1930	102.8734	102.1027	102.7218
	StdDev	2.0992	2.2884	2.3290	3.5241	3.3642	3.6289	3.5229	3.3214	2.9371
	Min	12.3101	11.2234	12.6637	48.0409	45.8823	48.4465	94.2705	94.7776	94.4545
	Max	22.4751	25.6646	23.1297	65.2742	66.1202	65.3575	112.2480	109.8810	110.5160
SOS	Average	17.7128	17.4930	17.3429	56.9744	57.5365	57.5824	102.1226	102.5853	102.0532
	StdDev	2.4874	2.3905	2.0367	3.2466	3.1485	3.6753	3.1925	3.2861	3.2809
	Min	13.0341	12.3140	13.3793	48.5565	49.8304	49.7414	95.0027	94.6137	95.0713
	Max	23.6252	24.9384	22.8146	65.6589	67.0995	64.7301	111.3420	110.5080	110.2190
EIGA	Average	2.2625	2.7135	3.1528	4.3338	4.7736	5.0215	11.5304	12.3963	12.4058
	StdDev	0.7861	0.7043	0.7400	1.1305	1.1188	0.9254	2.5238	2.4577	2.4006
	Min	0.9663	1.5654	1.7042	2.5753	2.5664	3.0930	5.7270	6.5900	7.0302
	Max	5.0991	5.3770	5.5247	7.1338	7.3742	7.5261	18.6680	17.8467	20.4191
MS	Average	2.3914	3.0518	3.3636	4.1477	4.6714	5.1973	6.6268	7.6385	7.7173
	StdDev	0.6952	0.8995	0.7763	1.3240	1.0982	1.3884	1.6908	1.7747	1.5956
	Min	1.2880	1.3239	1.6938	1.6061	2.7365	3.1354	2.9462	3.6793	4.5684
	Max	4.3833	5.5479	6.0009	9.0010	7.7089	11.6111	11.2651	11.9823	11.8893
MIeoA	Average	2.6268	3.1268	3.5648	4.1034	4.3518	4.9416	6.3771	7.3666	7.8102
	StdDev	0.8543	0.7441	0.7703	1.2635	0.9581	1.0567	1.8667	1.8888	1.7254
	Min	1.0779	1.3515	1.9404	1.7316	1.6060	2.7995	3.0623	3.6471	4.5184
	Max	5.1799	5.1842	6.3193	8.3797	7.1163	8.0434	11.7221	12.0812	12.8556
DQM00/AR	Average	5.0158	5.1289	5.1925	24.7478	27.1841	26.6526	46.8483	52.9857	57.9203
	StdDev	0.1110	0.1678	0.1475	1.4864	0.2097	0.3235	1.2779	0.5847	1.5092
	Min	4.8226	4.3339	5.0196	22.8802	26.7987	26.1773	42.3464	51.2184	56.4045
	Max	5.4097	5.2865	5.7041	28.1292	27.8187	27.6404	48.0355	53.9174	64.7470
ROOT	Average	5.0128	5.0281	5.2017	27.8810	27.5821	27.5304	62.2108	62.6200	61.7346
	StdDev	0.0794	0.1208	0.2192	0.4985	0.5745	0.2709	0.2574	0.4816	0.5414
	Min	4.7678	4.7822	5.0493	25.4001	25.6028	26.8723	61.5762	60.5105	59.2182
	Max	5.1905	5.3559	6.2701	28.3681	28.0833	28.4894	62.9206	63.1531	62.4639

Table 4: Results from EDO algorithms assessed in terms of the BDAC performance measure on a varied number of peaks and dimensions on the MMPBA benchmark problem.

AMT	Metric	SGA	SOS	EIGA	MS	MIGA	DQMOO/AR	ROOT	
Random	OE	average	5.843364	5.535581	19.79524	9.879483	13.62846	5.031803	0.583836
		std	0.89401	0.68539	1.170963	0.944251	0.902995	2.294556	0.220115
		min	3.79262	4.191188	17.46989	7.782645	11.35217	-1.28006	0.00202
		max	7.8634	7.029605	22.72122	12.68427	15.65091	9.196928	0.928946
	ARR	average	1.343234	0.901602	1.053497	1.140705	1.264991	0.730509	0.771565
		std	0.22305	0.166733	0.150825	0.245262	0.163721	0.085759	0.084441
		min	0.856786	0.63196	0.794451	0.79501	0.93947	0.538322	0.619094
		max	1.722536	1.217	1.436164	1.633768	1.577791	0.905831	0.95941
	BDAC	average	23.97984	35.97564	6.170782	7.233404	6.093264	18.85014	21.70592
		std	0.615071	0.423276	0.4538	0.426427	0.313625	1.095803	1.214539
		min	22.96875	35.36589	5.434575	6.52978	5.486582	13.3602	20.64957
		max	25.05193	36.92393	7.165924	7.869364	6.65801	19.94903	27.84296
	BEAC	average	6.063408	4.640095	0.480797	1.54007	-0.12261	5.102797	4.952875
		std	0.462261	0.507671	0.6232	0.400494	0.841969	0.204753	0.174854
		min	4.9751	3.864269	-0.54589	0.986168	-1.41476	4.617812	4.503
max		6.816552	5.659729	1.481944	2.25583	0.974392	5.506646	5.368348	
Linear	OE	average	17.10634	4.984889	19.61293	12.61728	6.793488	0.724882	0.616142
		std	1.144758	0.920612	1.035095	1.191797	1.230256	1.495108	0.168451
		min	14.69502	3.39002	18.15443	10.23659	4.001876	-2.31972	0.343599
		max	19.1043	6.94059	21.64331	14.97703	8.752415	3.940588	0.985704
	ARR	average	0.962264	1.612552	1.183657	0.828149	0.810963	0.907255	0.804215
		std	0.122935	0.184755	0.12751	0.157811	0.113943	0.078181	0.099567
		min	0.742574	1.336312	0.9341	0.597242	0.621421	0.794308	0.534933
		max	1.183534	1.910867	1.435666	1.179677	1.00267	1.070644	1.032935
	BDAC	average	31.13031	22.78337	6.817348	6.585875	5.320615	10.5071	19.3378
		std	0.789145	0.627706	0.215041	0.517521	0.573648	0.537465	0.65353
		min	29.56551	21.97974	6.346407	5.623657	4.620184	9.171676	18.38189
		max	32.14604	23.99607	7.253472	7.477955	6.526513	11.81313	22.46473
	BEAC	average	4.785213	4.401676	0.651576	0.878799	1.518982	3.5198	5.064916
		std	0.316448	0.41835	0.348962	0.434908	0.747977	0.225263	0.168139
		min	4.194489	3.783701	0.013441	0.064794	0.115731	2.948105	4.693577
max		5.268447	5.355986	1.317534	1.720607	2.601059	3.978825	5.468346	
Square	OE	average	4.579836	2.966836	8.390824	18.1598	11.12236	2.34783	0.545587
		std	0.885466	0.841167	1.45882	0.978943	1.395451	1.527187	0.205875
		min	2.618896	0.877148	6.259531	16.31258	8.50103	-1.43218	0.293408
		max	6.206015	4.460164	11.38711	20.51988	13.78761	6.362914	1.063154
	ARR	average	0.988637	1.322659	1.088754	0.627826	0.874768	0.85689	0.868198
		std	0.09657	0.134048	0.26124	0.158321	0.220444	0.071546	0.067418
		min	0.821367	1.006573	0.602513	0.366552	0.340025	0.669283	0.739916
		max	1.296969	1.562142	1.476963	0.9804	1.213067	1.004834	1.054619
	BDAC	average	37.29055	31.71489	8.008389	4.517655	6.990104	13.78278	23.29934
		std	0.652802	0.680539	0.604383	0.409417	0.518213	1.26951	0.952916
		min	36.59519	30.43061	7.08211	3.815734	6.392874	8.721418	21.87396
		max	38.6897	32.87488	8.882521	5.087682	8.117285	14.94496	26.6314
	BEAC	average	4.818214	5.450008	1.418546	1.643737	-0.29577	3.847203	4.972114
		std	0.320531	0.375935	0.759556	0.477518	1.013048	0.194442	0.151888
		min	4.155214	4.7283	0.378456	0.986704	-1.53955	3.145433	4.593919
max		5.308615	6.174996	2.537163	2.646701	1.266579	4.18334	5.275572	
Circle	OE	average	12.81677	-5.66549	15.14259	21.30521	19.44638	1.332414	0.941775
		std	1.082999	1.050541	1.144875	1.405387	1.090942	1.485216	0.38138
		min	9.969701	-8.04084	12.79414	18.39999	17.12837	-1.59056	0.548967
		max	14.69333	-3.42594	18.00661	23.69593	21.69682	6.703973	2.696016
	ARR	average	0.513455	1.542861	0.838657	1.138247	1.328312	0.900854	0.865926
		std	0.291715	0.12928	0.137934	0.158462	0.225018	0.092877	0.077499
		min	-0.11047	1.2575	0.624911	0.891343	0.9702	0.77344	0.706341
		max	0.9541	1.810974	1.108643	1.528507	1.687262	1.195549	1.075822
	BDAC	average	26.33609	34.8776	7.958363	6.182007	6.396082	15.35566	22.20696
		std	0.454148	0.539755	0.290096	0.2351	0.53463	0.625857	1.153698
		min	25.57929	34.07324	7.2617	5.720952	5.546673	13.63104	20.01309
		max	27.09357	35.88785	8.539317	6.59798	7.323776	17.05604	27.18743
	BEAC	average	5.621161	5.101933	1.139508	0.759697	0.370613	3.279905	4.758385
		std	0.631086	0.320992	0.364097	0.180145	0.577441	0.171202	0.135164
		min	4.846306	4.533127	0.477584	0.444786	-0.66968	3.06367	4.375317
max		6.676412	5.773807	1.743637	1.067333	1.17903	3.80708	4.989925	

Table 5: Comparison of the effect of different attractor movement types in MMPBA on the performance of compared algorithms (Circle and Square refer to the two deterministic styles discussed in the main article).

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	7.583828	5.529698	10.23348	1.017437	7.917095
	StdDev	0.240219	0.27242	0.336486	0.291289	0.212708
	Min	6.968554	4.817115	9.595428	0.544876	7.445338
	Max	8.071156	5.988191	10.92594	1.662444	8.50709
SOS	Average	3.965997	16.89852	6.882164	5.657908	20.76595
	StdDev	0.286883	0.27741	0.283771	0.231838	0.307027
	Min	3.414679	16.38412	6.263799	5.265418	20.12363
	Max	4.478443	17.40558	7.529406	6.094463	21.45449
EIGA	Average	-4.0644	-4.49256	-3.25213	3.194269	-2.92476
	StdDev	0.317364	0.256546	0.283029	0.239669	0.245288
	Min	-4.63185	-4.95318	-3.85498	2.754079	-3.49655
	Max	-3.56278	-3.84184	-2.79392	3.728671	-2.49166
MS	Average	3.83832	4.528549	3.56961	3.791962	4.227823
	StdDev	0.319443	0.312196	0.314483	0.255835	0.297591
	Min	3.309023	3.849265	3.082856	3.24422	3.642231
	Max	4.661724	5.192283	4.164974	4.207483	4.846295
MIGA	Average	7.968389	7.875354	7.6248	9.346952	5.715536
	StdDev	0.28097	0.23453	0.350874	0.237343	0.319402
	Min	7.419172	7.480856	6.913588	8.893462	5.043921
	Max	8.453506	8.437115	8.337776	9.920124	6.283556
DQMOO/AR	Average	3.552193	3.090873	4.149958	2.821483	3.405328
	StdDev	1.683263	2.244494	1.986383	1.156655	1.581386
	Min	0.308344	-3.24233	-1.65866	-0.0131	-1.20683
	Max	9.09538	7.773738	10.18112	4.958758	6.309687
ROOT	Average	3.807904	4.412535	3.042209	4.11963	3.655781
	StdDev	0.243164	0.210148	0.208267	0.170257	0.159687
	Min	3.244716	4.052303	2.526964	3.614643	3.416999
	Max	4.325175	4.743043	3.417094	4.489104	3.968894

Table 6: OE results of different attractor change frequencies and a weight of 0 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	9.703377	4.428271	5.590981	5.747462	2.522033
	StdDev	0.330589	0.28733	0.290226	0.22479	0.235931
	Min	9.194178	3.679128	5.022339	5.311585	1.855578
	Max	10.55536	4.999612	6.281512	6.214807	2.968143
	p-score	3.25E-06	1.11E-06	1.83E-06	7.67E-07	1.71E-06
SOS	Average	7.914762	18.81744	16.76433	21.5184	17.13614
	StdDev	0.236444	0.270424	0.227496	0.305136	0.274333
	Min	7.380679	17.96392	16.21285	21.04267	16.35301
	Max	8.26392	19.42241	17.21732	22.11354	17.74435
	p-score	2.77E-05	6.66E-07	1.03E-06	2.30E-06	1.77E-06
EIGA	Average	-1.29234	-0.11912	-4.4176	-3.45164	-0.57356
	StdDev	0.28074	0.370017	0.302217	0.251061	0.274051
	Min	-1.85167	-0.81154	-4.91908	-4.05424	-1.12041
	Max	-0.71837	0.909594	-3.73725	-2.85777	-0.13061
	p-score	8.35E-07	3.50E-07	2.57E-06	1.27E-06	2.51E-06
MS	Average	2.226664	6.334415	1.708507	2.97963	8.37532
	StdDev	0.256206	0.212058	0.305313	0.294236	0.267307
	Min	1.661385	6.023878	1.157932	2.255087	7.94111
	Max	2.853085	6.799659	2.60874	3.507234	8.849235
	p-score	6.56E-07	1.23E-06	8.85E-07	3.66E-06	1.94E-06
MIGA	Average	25.08919	5.954535	10.16784	9.209882	7.429503
	StdDev	0.296816	0.330073	0.29503	0.244594	0.270517
	Min	24.37012	5.495498	9.58366	8.641302	6.847187
	Max	25.54542	7.171878	10.87754	9.53485	7.879905
	p-score	1.05E-06	1.91E-06	1.54E-06	0.097763	3.45E-06
DQMOO/AR	Average	0.973783	1.981722	2.483335	2.960252	2.215041
	StdDev	1.400603	1.632496	1.208732	1.232831	1.052444
	Min	-1.5554	-1.93141	0.122189	0.64973	-0.04975
	Max	6.069812	5.896877	5.363407	6.124916	3.898363
	p-score	1.41E-05	0.008217	0.000283	0.765519	0.002585
ROOT	Average	1.82234	1.593335	3.103116	1.606739	2.521018
	StdDev	0.120827	0.158358	0.22927	0.206883	0.213701
	Min	1.496134	1.118549	2.567714	1.176766	2.066888
	Max	1.986399	1.836882	3.610639	1.980695	2.812146
	p-score	1.86E-06	1.98E-06	0.280214	2.03E-06	1.73E-06

Table 7: OE results of different attractor change frequencies and a weight of 0.005 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	8.186566	3.906864	7.770165	13.30599	5.905456
	StdDev	0.281354	0.311175	0.272916	0.34067	0.293968
	Min	7.638095	3.274709	7.175237	12.58849	5.281471
	Max	8.655204	4.489829	8.238692	13.71421	6.657642
	p-score	4.07E-06	1.50E-06	2.71E-06	2.27E-06	2.02E-08
SOS	Average	11.10451	8.380976	9.578811	15.84542	14.40895
	StdDev	0.254994	0.243144	0.230591	0.291529	0.240096
	Min	10.46025	7.896634	9.113662	15.11479	13.99565
	Max	11.52821	8.866859	10.22943	16.42209	14.84629
	p-score	2.13E-07	1.30E-06	9.30E-07	1.58E-06	1.29E-06
EIGA	Average	-1.75872	4.627836	-1.37574	-3.3254	-3.34873
	StdDev	0.351871	0.300369	0.307814	0.295265	0.216217
	Min	-2.41444	4.017365	-2.00475	-3.96932	-3.89501
	Max	-0.93341	5.311139	-0.42921	-2.88421	-2.89889
	p-score	8.35E-07	2.36E-06	1.44E-06	1.69E-06	2.42E-05
MS	Average	4.585438	6.198844	6.910345	5.539816	4.003469
	StdDev	0.250746	0.329798	0.285383	0.283305	0.255543
	Min	4.100481	5.570976	6.246661	5.138791	3.382343
	Max	5.116995	6.905257	7.460667	6.182767	4.383714
	p-score	2.92E-06	1.10E-06	2.56E-06	1.85E-06	0.006423
MIGA	Average	14.48996	13.11493	18.04837	15.97049	13.04252
	StdDev	0.252622	0.33831	0.335173	0.224507	0.333549
	Min	14.13827	12.43264	17.47213	15.46275	12.38833
	Max	15.0242	13.85181	18.682	16.39058	13.7484
	p-score	1.30E-06	3.09E-06	2.53E-06	1.01E-06	3.46E-06
DQMOO/AR	Average	2.263978	2.340279	1.599939	2.723141	2.42224
	StdDev	1.567356	1.522996	1.423569	1.324465	1.492342
	Min	-2.58509	-0.80691	-1.56534	-0.40914	-0.02668
	Max	7.099365	6.453723	4.173074	5.369596	7.479468
	p-score	0.001709	0.158855	3.39E-05	0.688359	0.020671
ROOT	Average	2.427303	2.609362	4.493802	5.426651	4.842648
	StdDev	0.353457	0.258709	0.357686	0.207423	0.229717
	Min	1.69408	2.04289	3.40214	4.938949	4.346648
	Max	3.766344	3.127504	5.498438	5.779221	5.240333
	p-score	5.03E-07	9.69E-07	1.10E-06	2.59E-06	2.92E-06

Table 8: OE results of different attractor change frequencies and a weight of 0.01 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	8.444474	8.782418	3.366159	5.741687	7.266634
	StdDev	0.307578	0.314727	0.284381	0.261703	0.332868
	Min	7.730547	8.049248	2.891158	5.271725	6.664428
	Max	9.064991	9.257616	3.987008	6.242425	7.997631
	p-score	6.52E-07	1.42E-06	4.58E-07	1.87E-06	1.11E-06
SOS	Average	4.213009	7.174513	9.937143	14.40999	7.208026
	StdDev	0.286355	0.260383	0.248253	0.323242	0.34308
	Min	3.75858	6.518508	9.390796	13.86982	6.502667
	Max	4.910418	7.586775	10.48365	15.46622	8.008234
	p-score	0.00499	1.33E-06	2.95E-06	3.29E-07	3.90E-06
EIGA	Average	0.566978	1.46593	-1.97169	-2.8508	-3.54977
	StdDev	0.291507	0.241047	0.281768	0.280588	0.287435
	Min	-0.04092	1.015263	-2.55375	-3.33136	-4.14448
	Max	1.14742	1.843668	-1.23896	-2.29814	-2.87199
	p-score	2.04E-06	5.62E-07	1.48E-07	1.88E-06	2.22E-06
MS	Average	5.87239	4.777213	11.41601	5.180593	6.508784
	StdDev	0.275296	0.28215	0.32748	0.245601	0.293085
	Min	5.219969	4.145233	10.80161	4.843034	6.087728
	Max	6.50847	5.263153	11.97381	5.815341	7.394129
	p-score	6.79E-07	0.006034	2.22E-06	1.12E-06	2.72E-06
MIGA	Average	6.999643	2.763093	10.30875	9.447334	13.53176
	StdDev	0.242507	0.256742	0.242528	0.300447	0.272586
	Min	6.33654	2.261121	9.851682	8.740416	13.01606
	Max	7.554394	3.237927	10.80257	10.00693	14.11557
	p-score	1.86E-06	1.39E-06	1.83E-06	0.158844	5.49E-07
DQMOO/AR	Average	1.463031	1.738073	2.617336	2.943649	3.776802
	StdDev	1.497006	1.453904	1.808491	1.575202	1.258514
	Min	-2.30607	-0.70238	-0.44423	-1.40277	2.053678
	Max	4.235172	6.31596	8.465368	5.150375	7.853311
	p-score	3.41E-05	0.003609	0.000771	0.503833	0.382034
ROOT	Average	2.620055	2.991175	4.417694	5.031475	4.361097
	StdDev	0.186512	0.210814	0.16778	0.254306	0.219293
	Min	2.190489	2.605192	4.088807	4.528679	3.986457
	Max	3.057484	3.469745	4.822568	5.57524	4.870648
	p-score	3.46E-06	3.18E-06	1.59E-06	1.32E-07	4.14E-07

Table 9: OE results of different attractor change frequencies and a weight of 0.015 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	5.256453	5.639955	4.956803	5.133948	5.290887
	StdDev	0.212039	0.211282	0.240782	0.187971	0.201526
	Min	4.771111	5.21736	4.430654	4.788118	4.886238
	Max	5.59259	6.087006	5.368612	5.616343	5.782371
SOS	Average	39.45056	42.7475	39.4731	42.36821	44.74014
	StdDev	0.162981	0.201506	0.174924	0.160859	0.255936
	Min	39.14741	42.40387	39.09943	42.05942	44.18712
	Max	39.80307	43.13039	39.95703	42.73896	45.32703
EIGA	Average	5.289681	5.082074	4.940892	4.956624	5.199705
	StdDev	0.162233	0.206505	0.196467	0.142526	0.175053
	Min	4.954686	4.677394	4.630683	4.541385	4.90483
	Max	5.615122	5.558191	5.382984	5.215671	5.594658
MS	Average	31.01584	27.75054	37.03208	35.08773	31.24145
	StdDev	0.213578	0.224009	0.211645	0.191154	0.222199
	Min	30.40429	27.22711	36.5909	34.74655	30.66173
	Max	31.37458	28.14997	37.61766	35.45437	31.77865
MIGA	Average	31.67178	40.92178	32.09287	34.36087	34.92358
	StdDev	0.180335	0.154618	0.248158	0.19981	0.184867
	Min	31.36593	40.60696	31.56144	33.88552	34.54659
	Max	31.99653	41.19626	32.74366	34.70717	35.226
DQMOO/AR	Average	5.008904	5.419935	5.122458	5.169628	5.404135
	StdDev	0.182795	0.22667	0.185551	0.178485	0.133024
	Min	4.388021	5.119771	4.66564	4.873093	5.174628
	Max	5.317064	6.140752	5.427111	5.730928	5.686616
ROOT	Average	5.192797	4.929639	5.124694	5.453282	5.054256
	StdDev	0.194707	0.152587	0.184826	0.152168	0.234367
	Min	4.788217	4.640457	4.824177	5.084453	4.564984
	Max	5.523525	5.193127	5.552454	5.723394	5.447746

Table 10: BDAC results of different attractor change frequencies and a weight of 0 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	4.949067	5.229757	5.116445	4.951853	5.151426
	StdDev	0.259303	0.180177	0.240737	0.184384	0.153028
	Min	4.434681	4.844923	4.742291	4.610575	4.812432
	Max	5.344335	5.471235	5.717363	5.326584	5.47733
	p-score	0.000115	3.59E-06	0.023035	0.001708	0.004681
SOS	Average	35.87287	43.61557	36.32992	35.31784	36.46063
	StdDev	0.209736	0.176915	0.160573	0.19747	0.168502
	Min	35.37215	43.26912	35.92479	34.96099	36.17081
	Max	36.19547	43.93849	36.6844	35.73595	36.81777
	p-score	1.45E-06	7.30E-07	1.30E-06	8.11E-07	1.75E-06
EIGA	Average	4.917158	5.069929	5.278898	5.151798	4.72913
	StdDev	0.150859	0.236358	0.210071	0.197248	0.174715
	Min	4.632111	4.747987	4.859663	4.723683	4.456507
	Max	5.222757	5.722172	5.680655	5.585183	5.250163
	p-score	5.73E-06	0.975387	1.93E-05	0.000241	1.53E-06
MS	Average	28.74639	23.71521	26.96801	30.41985	22.73728
	StdDev	0.162611	0.230389	0.247048	0.209446	0.193946
	Min	28.38998	23.23542	26.40539	29.99737	22.42006
	Max	29.09787	24.06428	27.3131	30.89574	23.16032
	p-score	1.31E-06	1.43E-06	2.65E-06	8.48E-07	2.28E-06
MIGA	Average	39.50113	28.44393	22.11573	36.74136	28.78198
	StdDev	0.158227	0.246135	0.199494	0.187609	0.186378
	Min	39.02904	28.04521	21.70061	36.35846	28.41268
	Max	39.74103	28.85006	22.39118	37.03162	29.2973
	p-score	1.81E-06	1.25E-06	1.98E-06	1.79E-06	2.21E-06
DQMOO/AR	Average	4.525082	5.072962	4.840903	5.015779	4.894938
	StdDev	0.208771	0.175467	0.162355	0.176727	0.197144
	Min	3.978824	4.845136	4.432823	4.712911	4.53371
	Max	4.87572	5.480906	5.210631	5.373462	5.302978
	p-score	3.08E-06	5.51E-06	8.12E-05	0.00873	1.07E-06
ROOT	Average	4.893177	5.008629	4.935311	4.993651	4.91176
	StdDev	0.170382	0.245876	0.25369	0.218195	0.188384
	Min	4.561749	4.519111	4.43487	4.531364	4.524913
	Max	5.246693	5.55509	5.709764	5.574673	5.315007
	p-score	2.07E-05	0.120445	0.001833	1.94E-06	0.027029

Table 11: BDAC results of different attractor change frequencies and a weight of 0.005 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	4.904239	4.884128	4.895299	4.794951	5.203374
	StdDev	0.199789	0.22465	0.186992	0.194813	0.180685
	Min	4.519494	4.282507	4.484233	4.369332	4.831042
	Max	5.450573	5.284917	5.285444	5.21451	5.488088
	p-score	4.45E-05	2.41E-06	0.205876	2.79E-06	0.078639
SOS	Average	22.68344	36.60529	35.5441	36.38075	30.45577
	StdDev	0.183941	0.181521	0.231067	0.184779	0.173544
	Min	22.33186	36.24715	35.20559	36.05827	30.06108
	Max	23.03706	36.96791	36.00699	36.79253	30.80838
	p-score	4.56E-06	1.60E-06	3.02E-06	1.23E-06	2.69E-06
EIGA	Average	5.007584	5.262153	4.604394	4.874655	5.287089
	StdDev	0.200679	0.164529	0.194559	0.202333	0.185231
	Min	4.584473	4.995139	4.080534	4.568096	4.856026
	Max	5.391376	5.67973	4.920838	5.454746	5.577363
	p-score	8.28E-05	6.91E-05	8.38E-06	0.049492	0.028482
MS	Average	28.49888	23.38528	20.14076	27.0859	23.82133
	StdDev	0.157691	0.18876	0.245677	0.202727	0.135975
	Min	28.07984	22.84145	19.741	26.50172	23.64366
	Max	28.76857	23.74761	20.665	27.41195	24.11785
	p-score	1.15E-06	1.08E-06	1.19E-07	2.95E-06	1.53E-06
MIGA	Average	33.05399	34.45773	32.06919	44.32024	34.82279
	StdDev	0.181331	0.191803	0.192451	0.218197	0.246928
	Min	32.61177	34.12117	31.59873	43.89737	34.31342
	Max	33.50334	34.83695	32.69673	44.7636	35.30827
	p-score	8.14E-07	1.44E-06	0.658322	3.03E-07	0.130581
DQMOO/AR	Average	4.734751	5.006638	5.05444	5.129646	4.900162
	StdDev	0.17007	0.192942	0.190703	0.142218	0.170532
	Min	4.478354	4.676318	4.664958	4.791922	4.467104
	Max	5.12986	5.391375	5.528094	5.57944	5.237733
	p-score	5.29E-05	3.04E-06	0.115608	0.477947	2.89E-06
ROOT	Average	4.945795	4.979564	5.332661	5.367821	4.904516
	StdDev	0.137492	0.202852	0.177389	0.20095	0.224922
	Min	4.626484	4.611179	4.888407	4.903702	4.46699
	Max	5.272296	5.42552	5.623341	5.735999	5.335345
	p-score	2.47E-05	0.503833	0.000205	0.038723	0.009271

Table 12: BDAC results of different attractor change frequencies and a weight of 0.01 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	4.806796	5.11766	4.818206	4.902424	4.977004
	StdDev	0.216083	0.236566	0.22777	0.158706	0.229009
	Min	4.353196	4.514569	4.427267	4.691093	4.665177
	Max	5.402448	5.439077	5.241843	5.278681	5.546674
	p-score	5.79E-06	2.70E-06	0.020668	0.000332	2.69E-05
SOS	Average	30.67603	30.12265	23.07139	26.69724	30.43283
	StdDev	0.207222	0.224008	0.18168	0.219271	0.21449
	Min	30.03942	29.6636	22.64618	26.25152	30.03792
	Max	31.00766	30.59762	23.42488	27.10726	30.80884
	p-score	2.37E-06	1.85E-06	6.22E-06	1.34E-06	2.20E-06
EIGA	Average	4.909177	5.257543	4.879462	5.118443	4.930047
	StdDev	0.221473	0.1967	0.21197	0.244363	0.214406
	Min	4.461766	4.914715	4.248662	4.755595	4.497862
	Max	5.420743	5.676796	5.308367	5.606537	5.259974
	p-score	3.23E-06	0.006834	0.245178	0.003853	2.68E-05
MS	Average	28.23043	17.56256	23.85265	22.53294	24.94822
	StdDev	0.214489	0.22459	0.176554	0.236902	0.187508
	Min	27.75955	17.23472	23.38825	21.91672	24.66778
	Max	28.75583	18.08406	24.2407	23.01491	25.43772
	p-score	1.36E-06	1.09E-06	3.50E-06	1.32E-06	6.32E-07
MIGA	Average	34.8007	25.08422	42.49327	20.03582	35.6861
	StdDev	0.205186	0.185373	0.202837	0.170776	0.205313
	Min	34.25078	24.7236	41.89747	19.72623	35.20972
	Max	35.27354	25.48281	42.92264	20.26195	36.05438
	p-score	3.27E-06	4.12E-06	3.89E-06	3.65E-06	3.74E-06
DQMOO/AR	Average	4.689953	4.954425	5.027679	5.188855	5.253433
	StdDev	0.205041	0.185394	0.163261	0.164003	0.218588
	Min	4.130974	4.579186	4.74303	4.889944	4.727112
	Max	5.08095	5.338202	5.354858	5.572777	5.68719
	p-score	9.35E-06	4.21E-06	0.033269	0.440522	0.019569
ROOT	Average	4.95656	5.113802	4.974438	4.999795	5.259144
	StdDev	0.210852	0.196489	0.200524	0.218096	0.173815
	Min	4.555261	4.63354	4.546075	4.417359	4.949031
	Max	5.624277	5.519845	5.323265	5.320782	5.633681
	p-score	3.36E-05	0.001197	0.011748	1.49E-06	0.000174

Table 13: BDAC results of different attractor change frequencies and a weight of 0.015 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	20.24969	18.55142	16.14635	16.17715	20.82569
	StdDev	0.199826	0.187248	0.210366	0.16837	0.186946
	Min	19.77869	18.19962	15.83908	15.69461	20.50939
	Max	20.61626	18.83611	16.72872	16.52329	21.14728
SOS	Average	15.50093	17.40339	14.0181	16.01275	18.50622
	StdDev	0.212944	0.190747	0.18546	0.209779	0.145976
	Min	15.11945	16.91394	13.66751	15.61456	18.24559
	Max	15.94809	17.67133	14.40827	16.54133	18.79165
EIGA	Average	17.72739	18.63165	17.63745	17.30742	17.59642
	StdDev	0.228645	0.236508	0.184925	0.204081	0.247576
	Min	17.31866	18.1322	17.2476	16.88867	17.25991
	Max	18.41267	19.06225	17.97092	17.71043	18.1227
MS	Average	11.12175	8.764283	13.07526	9.391832	9.587238
	StdDev	0.176692	0.170519	0.149971	0.216264	0.232206
	Min	10.78027	8.476119	12.76226	9.04313	9.017141
	Max	11.40229	9.153423	13.43209	10.12127	10.01618
MIGA	Average	15.04942	14.43597	10.785	17.54816	13.05887
	StdDev	0.237667	0.188773	0.158562	0.193458	0.167636
	Min	14.5731	14.13638	10.45853	17.17169	12.76746
	Max	15.48774	14.89033	11.12101	17.86943	13.36553
DQMOO/AR	Average	18.42325	17.43733	18.71914	17.47024	19.7441
	StdDev	0.586957	0.800548	0.623601	0.330102	0.654482
	Min	17.65641	16.33132	17.99187	16.89009	16.97986
	Max	21.02834	20.56411	21.56485	18.68649	21.07192
ROOT	Average	20.20231	20.96826	18.64026	25.56025	22.70059
	StdDev	0.497607	0.469011	0.210907	0.420195	0.180045
	Min	18.56629	19.35007	18.15153	24.16395	22.3036
	Max	21.28216	22.66111	19.11465	26.93469	23.13833

Table 14: BEAC results of different attractor change frequencies and a weight of 0 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	19.15662	18.30438	16.65083	15.65658	18.47734
	StdDev	0.187705	0.194037	0.238065	0.195428	0.189917
	Min	18.79386	17.69295	16.10256	15.07932	18.05947
	Max	19.43524	18.69147	16.97833	15.94423	18.80766
	p-score	2.02E-06	0.000205	2.29E-06	1.90E-06	2.05E-06
SOS	Average	15.79519	15.77464	13.81264	17.88246	16.36443
	StdDev	0.178811	0.20961	0.18196	0.184691	0.24045
	Min	15.43011	15.16803	13.45282	17.64141	15.84007
	Max	16.07152	16.10284	14.15703	18.2396	16.7924
	p-score	2.46E-05	3.38E-06	0.000962	9.17E-07	1.83E-06
EIGA	Average	19.57262	17.31961	20.22948	22.63276	15.88535
	StdDev	0.23083	0.198172	0.172508	0.191718	0.229961
	Min	19.03059	16.85768	19.85406	22.26258	15.46376
	Max	20.04423	17.67001	20.66375	23.0411	16.61388
	p-score	3.28E-06	9.58E-07	1.96E-06	1.75E-06	7.00E-07
MS	Average	11.49931	10.02049	9.078778	9.882839	10.59462
	StdDev	0.195125	0.208674	0.189701	0.181915	0.16209
	Min	11.10374	9.736248	8.513733	9.601031	10.32785
	Max	11.85273	10.45481	9.313868	10.27521	11.08901
	p-score	9.75E-06	1.14E-06	1.65E-06	2.41E-06	2.01E-06
MIGA	Average	18.08412	11.93239	11.02209	17.62495	15.25904
	StdDev	0.201327	0.188162	0.20078	0.221229	0.206303
	Min	17.37054	11.6379	10.57712	17.11828	14.73963
	Max	18.37134	12.46735	11.58188	17.9109	15.64306
	p-score	3.55E-06	2.51E-06	3.84E-05	0.205876	7.54E-07
DQMOO/AR	Average	19.20727	16.29483	16.55711	16.79269	17.33562
	StdDev	0.385082	0.697247	0.430895	0.398582	0.634584
	Min	18.02052	12.8852	15.7696	15.95043	15.93627
	Max	20.279	16.94027	17.86739	18.22484	19.23192
	p-score	8.08E-06	3.42E-06	1.18E-06	1.29E-06	4.78E-06
ROOT	Average	22.98774	17.21739	21.14183	17.18555	17.12946
	StdDev	0.699118	0.26394	0.202909	0.168881	0.263517
	Min	20.2916	16.49652	20.64258	16.8769	16.39778
	Max	24.22359	17.93977	21.53155	17.47316	17.78458
	p-score	1.81E-06	8.08E-07	3.00E-06	2.13E-06	7.41E-07

Table 15: BEAC results of different attractor change frequencies and a weight of 0.005 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	17.91537	18.35897	17.86244	21.91224	18.78123
	StdDev	0.205348	0.223069	0.202405	0.209534	0.229461
	Min	17.57121	17.8352	17.44744	21.66082	18.33011
	Max	18.36408	18.78457	18.32866	22.44626	19.2956
	p-score	2.41E-06	0.002957	2.12E-06	1.62E-06	1.63E-06
SOS	Average	13.1451	17.82294	17.14128	20.62175	13.14885
	StdDev	0.159666	0.206751	0.157261	0.173531	0.215326
	Min	12.84265	17.40356	16.74528	20.31527	12.6344
	Max	13.41277	18.25681	17.39273	20.99205	13.47395
	p-score	1.38E-06	1.28E-06	1.87E-06	2.20E-06	1.86E-06
EIGA	Average	17.61997	17.95608	17.95287	19.61058	20.47405
	StdDev	0.201346	0.229072	0.239295	0.163256	0.135895
	Min	17.18283	17.53971	17.48138	19.34024	20.25121
	Max	18.10153	18.53608	18.37305	20.01184	20.68736
	p-score	0.089709	1.55E-06	4.00E-06	2.01E-06	2.71E-06
MS	Average	10.34669	11.23817	9.769581	10.93407	9.949979
	StdDev	0.215132	0.230173	0.218361	0.241338	0.171525
	Min	9.984453	10.79237	9.352388	10.39443	9.636063
	Max	10.77601	11.68008	10.22037	11.29999	10.2499
	p-score	2.43E-06	1.61E-06	3.81E-07	2.63E-06	1.30E-05
MIGA	Average	14.15357	14.7533	18.10854	23.12603	17.53963
	StdDev	0.220889	0.174504	0.153247	0.221174	0.142165
	Min	13.58394	14.26794	17.88414	22.74563	17.241
	Max	14.6288	14.99657	18.40735	23.67259	17.82279
	p-score	2.59E-06	8.16E-05	2.42E-06	1.82E-06	2.82E-07
DQMOO/AR	Average	18.83741	16.15194	17.62958	18.11102	20.6317
	StdDev	0.637107	0.527761	0.546396	0.878602	0.9489
	Min	17.00809	14.13992	15.62597	14.53461	19.55606
	Max	20.78191	16.85174	18.26373	19.27628	23.569
	p-score	0.001114	3.26E-06	2.53E-06	0.002765	7.75E-06
ROOT	Average	18.98882	20.68509	20.19968	25.28034	23.94513
	StdDev	1.10322	0.303912	0.348839	0.224238	0.335334
	Min	14.31226	19.84571	19.02019	24.75839	22.87841
	Max	20.76308	21.61582	21.32242	25.69518	25.04503
	p-score	8.54E-06	0.000106	2.61E-06	0.000261	2.08E-07

Table 16: BEAC results of different attractor change frequencies and a weight of 0.01 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	13.93944	18.75212	16.88878	18.73116	19.60584
	StdDev	0.190122	0.236338	0.194572	0.190267	0.146751
	Min	13.58168	18.27075	16.53046	18.40857	19.21902
	Max	14.2997	19.21702	17.36226	19.10813	19.90065
	p-score	1.12E-06	0.004113	1.38E-06	1.68E-06	1.15E-06
SOS	Average	13.77317	13.62403	14.82241	16.33923	17.47188
	StdDev	0.226364	0.205662	0.142706	0.206829	0.228749
	Min	13.33639	13.18704	14.50803	16.01953	17.01568
	Max	14.49317	14.05352	15.10489	16.75718	17.90157
	p-score	1.42E-06	1.53E-06	1.40E-06	2.57E-05	1.85E-06
EIGA	Average	17.97875	16.94208	17.80695	18.60119	17.39846
	StdDev	0.185155	0.182946	0.190332	0.216838	0.183469
	Min	17.41861	16.44378	17.49147	18.22585	17.13637
	Max	18.27009	17.24556	18.2162	18.95945	17.91267
	p-score	0.00057	2.37E-06	0.001832	3.52E-05	0.002957
MS	Average	11.2003	9.374059	10.37705	11.22995	11.08893
	StdDev	0.203623	0.22714	0.183235	0.202809	0.226045
	Min	10.8504	8.92333	10.00849	10.72033	10.64882
	Max	11.65547	9.764556	10.77959	11.71266	11.64966
	p-score	0.051924	1.35E-06	1.73E-06	2.90E-06	3.20E-06
MIGA	Average	18.09785	13.68798	22.04324	13.61239	13.72984
	StdDev	0.17682	0.173712	0.264923	0.199884	0.203246
	Min	17.66019	13.20747	21.47768	13.16042	13.21613
	Max	18.44928	14.01217	22.6223	13.95794	14.22617
	p-score	1.58E-06	1.85E-06	7.58E-07	8.21E-07	2.67E-06
DQMOO/AR	Average	16.58612	18.62061	17.16177	20.28873	19.26595
	StdDev	0.407535	0.606219	0.4831	0.458233	1.007724
	Min	15.0981	15.94529	15.62002	19.49253	15.18054
	Max	17.33764	19.66816	18.25732	22.17137	20.41706
	p-score	1.71E-06	5.28E-05	2.45E-06	1.55E-06	0.003162
ROOT	Average	22.43511	20.96052	24.99693	24.20218	21.36864
	StdDev	0.215522	0.615042	0.226857	0.441431	0.513623
	Min	21.94911	18.68287	24.49758	22.76218	19.55528
	Max	23.06671	23.1907	25.41974	25.67245	23.16996
	p-score	1.53E-06	0.942611	3.14E-06	1.41E-06	4.78E-07

Table 17: BEAC results of different attractor change frequencies and a weight of 0.015 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	0.898647	0.864786	0.912726	0.979341	0.898825
	StdDev	0.096031	0.113804	0.098383	0.109665	0.111512
	Min	0.753976	0.67263	0.707361	0.722246	0.63361
	Max	1.139813	1.11459	1.083311	1.240083	1.043522
SOS	Average	0.791913	0.803679	0.822893	0.788979	0.811397
	StdDev	0.085712	0.108871	0.102971	0.092727	0.106973
	Min	0.603809	0.651083	0.647341	0.624132	0.616406
	Max	0.926404	1.123147	1.067537	1.034439	1.046493
EIGA	Average	1.035845	1.033571	1.058646	1.053062	1.049846
	StdDev	0.107811	0.093075	0.08294	0.106809	0.111554
	Min	0.795011	0.811015	0.884933	0.847073	0.840744
	Max	1.286414	1.177408	1.176615	1.201737	1.230661
MS	Average	0.891478	0.900294	0.874536	0.932466	0.921289
	StdDev	0.099288	0.105114	0.086118	0.108676	0.077827
	Min	0.711398	0.657487	0.745805	0.675958	0.773073
	Max	1.11586	1.123739	1.105732	1.155867	1.058036
MIGA	Average	0.838294	0.859902	0.937681	0.826596	0.876622
	StdDev	0.089794	0.102093	0.089899	0.110342	0.097673
	Min	0.620963	0.711024	0.741302	0.60799	0.709426
	Max	0.975178	1.140284	1.127541	1.028027	1.040733
DQMOO/AR	Average	0.782478	0.708211	0.743134	0.76108	0.699038
	StdDev	0.068116	0.116014	0.071045	0.076674	0.067972
	Min	0.652761	0.535295	0.56881	0.577005	0.513963
	Max	0.902425	0.985168	0.935243	0.916462	0.816552
ROOT	Average	0.76034	0.699593	0.767333	0.760791	0.720009
	StdDev	0.074796	0.108415	0.086541	0.099334	0.103953
	Min	0.584288	0.48371	0.535411	0.542059	0.499352
	Max	0.91797	0.890821	0.994847	0.96526	0.899984

Table 18: ARR results of different attractor change frequencies and a weight of 0 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	0.918386	0.890283	0.896304	0.924775	0.937266
	StdDev	0.110742	0.090584	0.089032	0.100086	0.071308
	Min	0.714742	0.692225	0.681184	0.735229	0.787663
	Max	1.122339	1.070595	1.080749	1.130269	1.050767
	p-score	0.599926	0.262286	0.465271	0.049492	0.205876
SOS	Average	0.79903	0.806778	0.855227	0.789197	0.791109
	StdDev	0.116203	0.107416	0.090819	0.101813	0.11905
	Min	0.587527	0.639253	0.659138	0.583721	0.555856
	Max	1.073226	1.009908	1.084498	0.98612	1.014321
	p-score	0.926253	0.845076	0.130581	0.861209	0.328558
EIGA	Average	1.031515	1.023391	1.091395	1.036206	1.129481
	StdDev	0.109647	0.08911	0.102882	0.102847	0.102056
	Min	0.824345	0.861071	0.942927	0.816817	0.931668
	Max	1.350854	1.175703	1.271246	1.227238	1.340653
	p-score	0.734319	0.797093	0.171365	0.571636	0.00727
MS	Average	0.886083	0.90676	0.957154	0.942696	0.907683
	StdDev	0.122826	0.09721	0.112823	0.12405	0.08926
	Min	0.662801	0.63851	0.708188	0.709292	0.725487
	Max	1.139624	1.048157	1.133463	1.192305	1.093882
	p-score	0.909928	0.975387	0.006834	0.734319	0.628834
MIGA	Average	0.826155	0.840236	0.885647	0.78525	0.859055
	StdDev	0.107822	0.100557	0.096465	0.088401	0.097698
	Min	0.625272	0.623362	0.660374	0.610355	0.65901
	Max	1.007114	1.019192	1.060519	0.971018	1.031039
	p-score	0.428418	0.543996	0.040697	0.125428	0.271143
DQMOO/AR	Average	0.805197	0.80627	0.792792	0.762413	0.700234
	StdDev	0.09201	0.079624	0.094416	0.075083	0.068252
	Min	0.650724	0.624165	0.661881	0.586609	0.510277
	Max	1.06831	0.988093	1.096076	0.918216	0.83276
	p-score	0.213358	0.000616	0.020671	0.253644	0.909931
ROOT	Average	0.794657	0.773509	0.801462	0.793232	0.801062
	StdDev	0.072312	0.114937	0.087121	0.113056	0.076433
	Min	0.619525	0.468069	0.619776	0.485239	0.602812
	Max	0.987317	0.967783	1.006635	1.057976	0.998354
	p-score	0.031603	0.00873	0.14704	0.221022	0.001287

Table 19: ARR results of different attractor change frequencies and a weight of 0.005 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	0.909006	0.935791	0.928715	0.907124	0.89589
	StdDev	0.111512	0.104461	0.116555	0.109342	0.1179
	Min	0.645301	0.723264	0.698593	0.716096	0.676988
	Max	1.125744	1.114146	1.120669	1.113332	1.13344
	p-score	0.557732	0.023035	0.543996	0.00984	0.749865
SOS	Average	0.874042	0.827356	0.789149	0.73309	0.859248
	StdDev	0.083112	0.093613	0.078297	0.108011	0.079716
	Min	0.715233	0.668219	0.559447	0.48085	0.658262
	Max	1.035059	1.100863	1.015679	0.994129	0.987345
	p-score	0.001832	0.349333	0.262286	0.097763	0.106385
EIGA	Average	1.079103	0.975809	1.076138	1.016642	1.102123
	StdDev	0.113347	0.077993	0.071284	0.114381	0.081684
	Min	0.807476	0.840095	0.955315	0.769675	0.994101
	Max	1.306022	1.175151	1.233678	1.200318	1.284246
	p-score	0.102002	0.035004	0.404822	0.298931	0.089709
MS	Average	0.918505	0.924528	0.927696	0.919314	0.872059
	StdDev	0.090857	0.116454	0.092279	0.084711	0.098356
	Min	0.74905	0.702073	0.652475	0.773378	0.692233
	Max	1.162806	1.221889	1.098067	1.099763	1.113963
	p-score	0.15285	0.643508	0.027025	0.465271	0.017515
MIGA	Average	0.872077	0.842388	0.78188	0.765918	0.809991
	StdDev	0.120435	0.088726	0.118987	0.100949	0.114717
	Min	0.656271	0.664307	0.585459	0.55749	0.594655
	Max	1.195388	1.08121	1.101613	0.92826	1.026094
	p-score	0.465271	0.571636	0.000125	0.031599	0.018516
DQMOO/AR	Average	0.809439	0.794368	0.766009	0.758624	0.768999
	StdDev	0.088409	0.098746	0.081017	0.090528	0.120487
	Min	0.60922	0.505571	0.480012	0.51247	0.536726
	Max	0.986757	0.961139	0.91778	1.002589	1.098691
	p-score	0.082206	0.007271	0.280214	0.926255	0.011748
ROOT	Average	0.761519	0.782541	0.691941	0.709505	0.710688
	StdDev	0.084916	0.116473	0.083088	0.108977	0.101444
	Min	0.541706	0.549525	0.502014	0.452349	0.516069
	Max	0.925395	0.991525	0.867175	0.874152	0.948779
	p-score	0.703564	0.006424	0.001484	0.00873	0.643517

Table 20: ARR results of different attractor change frequencies and a weight of 0.01 of the MMPBA problem.

		Change Frequency				
Algorithm		1	2	5	10	20
SGA	Average	0.959853	0.892301	0.938199	0.946406	0.948692
	StdDev	0.100699	0.084925	0.093581	0.104058	0.11592
	Min	0.799418	0.712025	0.720028	0.645324	0.770398
	Max	1.143101	1.052014	1.161609	1.105834	1.115852
	p-score	0.047156	0.428418	0.428418	0.308602	0.15285
SOS	Average	0.878927	0.843562	0.853341	0.825268	0.816168
	StdDev	0.062163	0.075316	0.094767	0.097471	0.102115
	Min	0.716955	0.711137	0.647561	0.594609	0.591153
	Max	0.979046	0.968984	1.099983	0.996399	0.963811
	p-score	0.000332	0.078639	0.177896	0.089709	0.845076
EIGA	Average	1.019978	1.040931	1.093905	1.076588	1.089619
	StdDev	0.102116	0.089606	0.087158	0.101272	0.094461
	Min	0.758447	0.824129	0.854561	0.84955	0.944011
	Max	1.143767	1.199419	1.27276	1.267955	1.296311
	p-score	0.845076	0.958989	0.097763	0.530429	0.177896
MS	Average	0.905511	0.902792	0.91759	0.915245	0.886201
	StdDev	0.088352	0.09476	0.094519	0.095773	0.106364
	Min	0.74606	0.746741	0.754677	0.744893	0.726564
	Max	1.080997	1.054417	1.193003	1.070998	1.09096
	p-score	0.643508	0.44051	0.075206	0.813012	0.262286
MIGA	Average	0.778266	0.897344	0.759124	0.891604	0.857498
	StdDev	0.093354	0.080485	0.097697	0.104389	0.084527
	Min	0.61254	0.770442	0.49058	0.680226	0.670323
	Max	0.960465	1.06379	0.917636	1.096433	1.017617
	p-score	0.028482	0.120435	3.41E-06	0.038718	0.452795
DQMOO/AR	Average	0.856391	0.809072	0.737571	0.820863	0.739159
	StdDev	0.08768	0.077803	0.082361	0.077005	0.05714
	Min	0.681013	0.624725	0.487642	0.704953	0.663587
	Max	1.103001	1.003524	0.871454	0.952908	0.926509
	p-score	0.001382	0.000831	0.382034	0.011079	0.059836
ROOT	Average	0.777486	0.780842	0.741274	0.675369	0.696417
	StdDev	0.08995	0.090049	0.068962	0.10487	0.101364
	Min	0.610391	0.629163	0.619899	0.449073	0.526751
	Max	1.018502	0.993845	0.904833	0.84173	0.89054
	p-score	0.718888	0.004992	0.093676	0.003162	0.318491

Table 21: ARR results of different attractor change frequencies and a weight of 0.015 of the MMPBA problem.