

Modyfikacje/hybrydyzacje algorytmu PSO w zadaniu optymalizacji globalnej wielowymiarowej funkcji ciągłej

PSO-DE Hybrid

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ABSTRACT

Dokumentacja uzyskanych wyników hybrydy PSO-DE

Categories and Subject Descriptors

G.1.6 [Numerical Analysis]: Optimization—*global optimization, unconstrained optimization*; F.2.1 [Analysis of Algorithms and Problem Complexity]: Numerical Algorithms and Problems

General Terms

Algorithms

Keywords

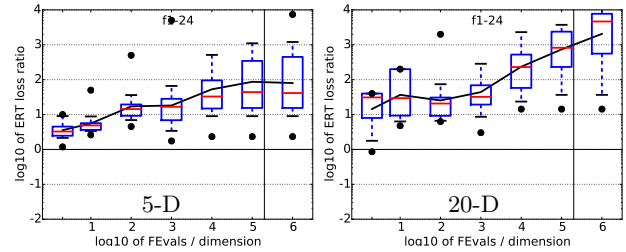
Benchmarking, PSODE, Optymalizacja wielowymiarowej funkcji ciągłej

1. CPU TIMING

In order to evaluate the CPU timing of the algorithm, we have run the PSO-DE Hybrid on the function f_8 with restarts for at least 30 seconds and until a maximum budget equal to $400(D+2)$ is reached. The code was run on a Windows 8 Intel(R) Core(TM) i7-4500U CPU @ 2.39GHz with 1 processor and 2 cores. The time per function evaluation for dimensions 2, 3, 5, 10, 20 equals $1,9e^{-10}$, $2,2e^{-10}$, $2,4e^{-10}$, $3,5e^{-10}$ and $6,1e^{-10}$ seconds respectively.

2. RESULTS

Results of PSO DE from experiments according to [?] on the benchmark functions given in [?, ?] are presented in Figures 1, 2, 3, and 4 and in Tables 1.



f_1-f_{24} in 5-D, maxFE/D=199938						
#FEs/D	best	10%	25%	med	75%	90%
2	1.2	2.0	2.4	3.3	4.9	10
10	2.6	3.3	3.6	4.9	5.8	14
100	4.5	6.7	9.1	14	20	87
1e3	1.7	3.0	6.6	17	30	1.0e2
1e4	2.3	7.7	15	33	96	5.7e2
1e5	2.3	7.7	15	44	3.7e2	1.6e3
1e6	2.3	7.7	15	41	4.9e2	1.3e3
RL _{US} /D	2e5	2e5	2e5	2e5	2e5	2e5
f_1-f_{24} in 20-D, maxFE/D=199979						
#FEs/D	best	10%	25%	med	75%	90%
2	0.86	0.99	7.3	31	40	40
10	4.8	6.0	8.7	30	2.0e2	2.0e2
100	6.3	6.5	8.8	21	32	2.7e2
1e3	3.0	6.5	19	32	73	3.0e2
1e4	14	21	55	2.3e2	5.7e2	2.6e3
1e5	14	30	2.2e2	8.2e2	2.6e3	3.8e3
1e6	14	30	4.8e2	4.7e3	7.8e3	1.3e4
RL _{US} /D	2e5	2e5	2e5	2e5	2e5	2e5

Figure 3: ERT loss ratio versus the budget in number of f -evaluations divided by dimension. For each given budget FEvals, the target value f_t is computed as the best target f -value reached within the budget by the given algorithm. Shown is then the ERT to reach f_t for the given algorithm or the budget, if the GECCO-BBOB-2009 best algorithm reached a better target within the budget, divided by the best ERT seen in GECCO-BBOB-2009 to reach f_t . Line: geometric mean. Box-Whisker error bar: 25-75%-ile with median (box), 10-90%-ile (caps), and minimum and maximum ERT loss ratio (points). The vertical line gives the maximal number of function evaluations in a single trial in this function subset. See also Figure 4 for results on each function subgroup.

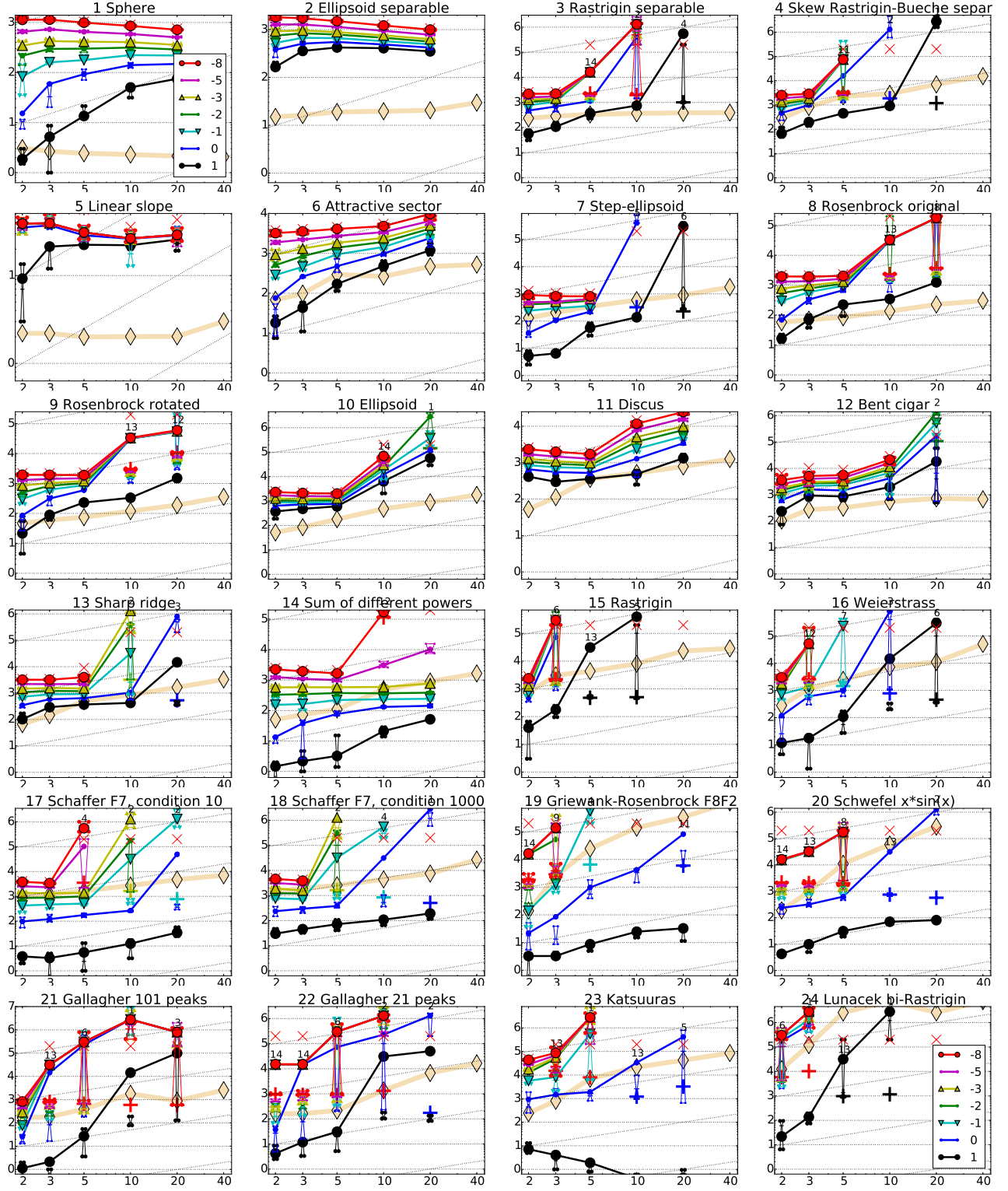


Figure 1: Expected number of f -evaluations (ERT, lines) to reach $f_{\text{opt}} + \Delta f$; median number of f -evaluations (+) to reach the most difficult target that was reached not always but at least once; maximum number of f -evaluations in any trial (\times); interquartile range with median (notched boxes) of simulated runlengths to reach $f_{\text{opt}} + \Delta f$; all values are divided by dimension and plotted as \log_{10} values versus dimension. Shown are $\Delta f = 10^{\{-8, -5, -3, -2, -1, 0, 1\}}$. Numbers above ERT-symbols (if appearing) indicate the number of trials reaching the respective target. The light thick line with diamonds indicates the respective best result from BBOB-2009 for $\Delta f = 10^{-8}$. Horizontal lines mean linear scaling, slanted grid lines depict quadratic scaling.

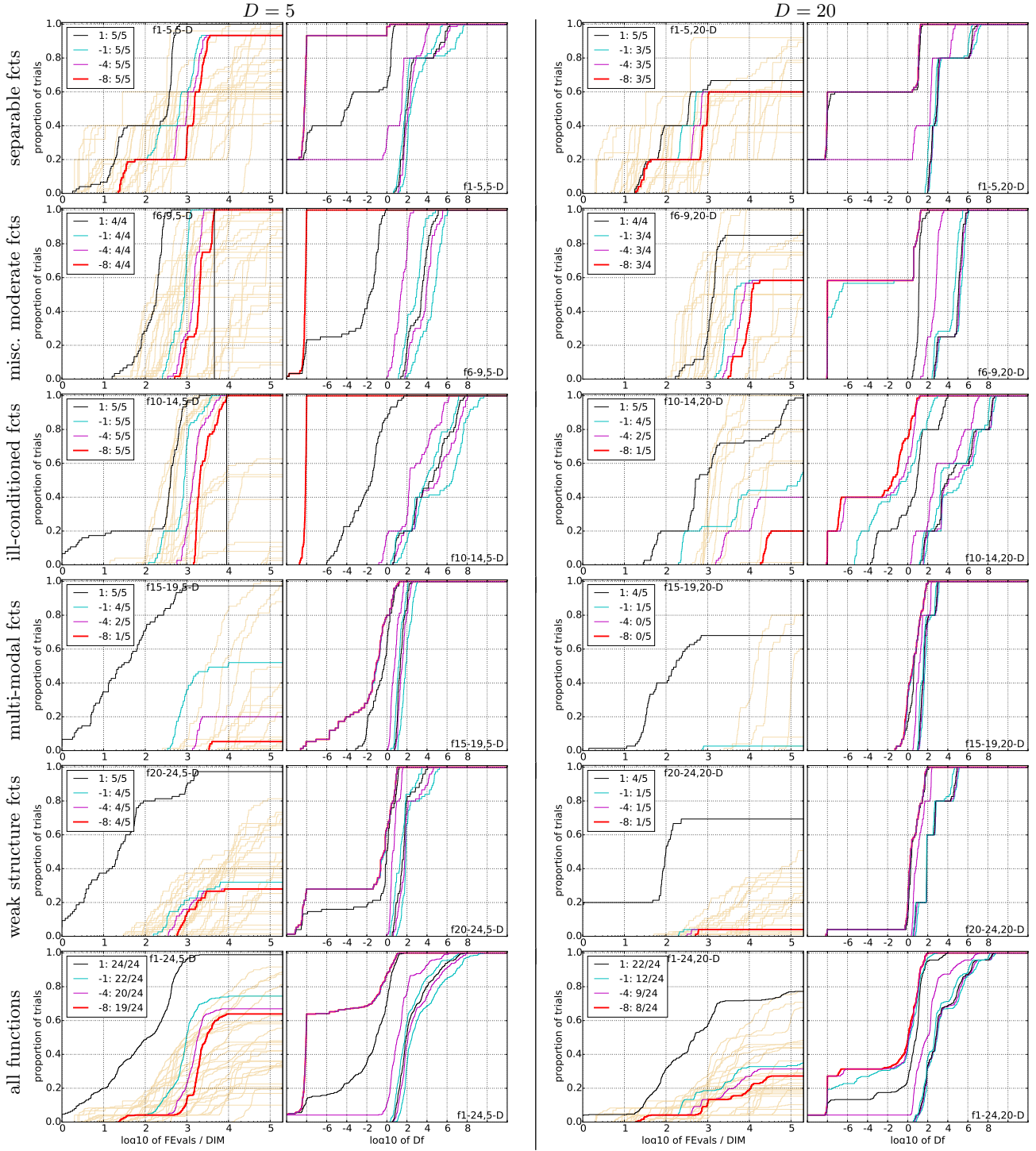


Figure 2: Empirical cumulative distribution functions (ECDF), plotting the fraction of trials with an outcome not larger than the respective value on the x -axis. Left subplots: ECDF of the number of function evaluations (FEvals) divided by search space dimension D , to fall below $f_{\text{opt}} + \Delta f$ with $\Delta f = 10^k$, where k is the first value in the legend. The thick red line represents the most difficult target value $f_{\text{opt}} + 10^{-8}$. Legends indicate for each target the number of functions that were solved in at least one trial within the displayed budget. Right subplots: ECDF of the best achieved Δf for running times of $0.5D, 1.2D, 3D, 10D, 100D, 1000D, \dots$ function evaluations (from right to left cycling cyan-magenta-black...) and final Δf -value (red), where Δf and Df denote the difference to the optimal function value. Light brown lines in the background show ECDFs for the most difficult target of all algorithms benchmarked during BBOB-2009.

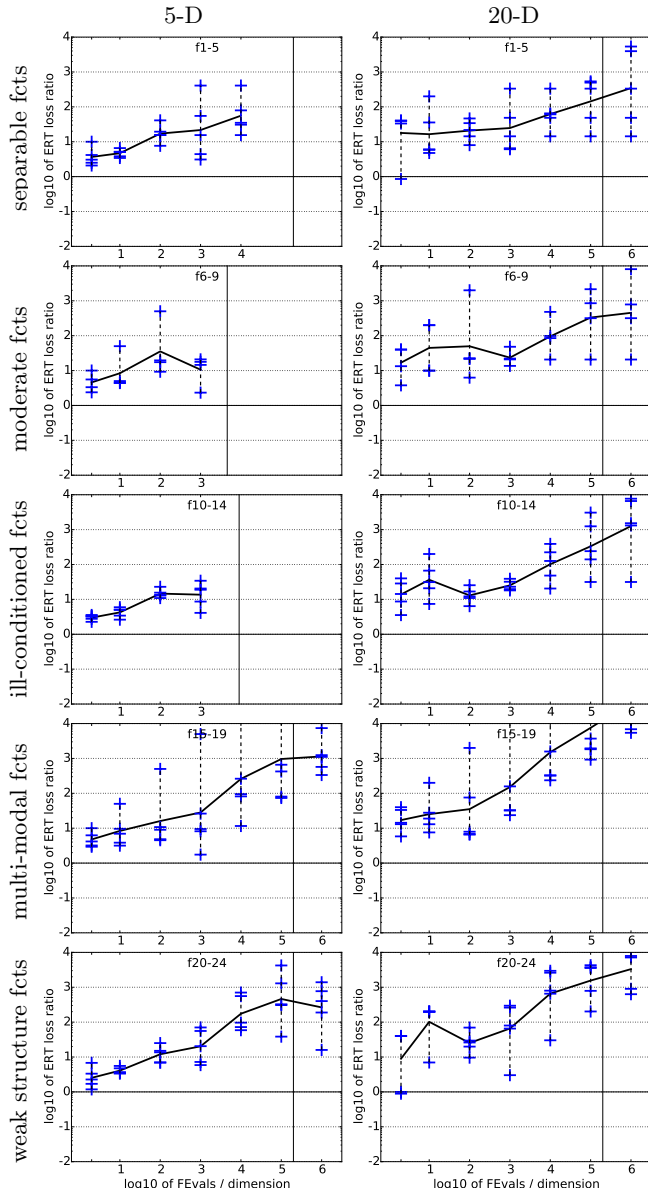


Figure 4: ERT loss ratios (see Figure 3 for details). Each cross (+) represents a single function, the line is the geometric mean.