

Readme

Code files

code files are in subfolder './code/', one part of which is from '<https://github.com/HisaoLabSUSTC/BenchSS>'

1. our algorithms for each quality indicator:

- Code for GSEMO-HV:
 - GSEMOHV.m
 - function [RecordHV,RecordR2,Subset,time]=GSEMOHV(PopObj,selNum,r,W)
 - PopObj: the set of candidate solutions.
 - selNum: the constraint on the number of selected solutions.
 - r: reference point
 - W: the set of direction vectors for hypervolume approximate indicator
- Code for GSEMO-ACC-IGD:
 - GSEMOIGD.m
 - function [Record,Subset,time]=GSEMOIGD(PopObj,selNum)
 - PopObj: the set of candidate solutions.
 - selNum: the constraint on the number of selected solutions.
- Code for GSEMO-ACC-IGD+:
 - GSEMOIGDp.m
 - function [Record,Subset,time]=GSEMOIGDp(PopObj,selNum)
 - PopObj: the set of candidate solutions.
 - selNum: the constraint on the number of selected solutions.
- Code for GSEMO-ACC-R2:
 - GSEMO R2Tchebycheff.m
 - function [RecordR2Tch,Subset,time]=GSEMO R2Tchebycheff(PopObj,selNum,r,W)
 - PopObj: the set of candidate solutions.
 - selNum: the constraint on the number of selected solutions.
 - r: Utopian point
 - W: the set of weight vectors for R2 indicator

2. corresponding greedy algorithms for each quality indicator:

- GreedyHVSelection.m
- LazyIGDSelection.m
- LazyIGDpSelection.m
- LazyR2TchebycheffSelection.m

3. code for each quality indicator:

- Code for hypervolume indicator:
 - HV.m
- Code for IGD indicator:

- IGD.m
- Code for IGD+ indicator:
 - IGDp.m
- Code for R2 indicator:
 - R2Tchebycheff.m
- Code for hypervolume approximation indicator:
 - R2ind.m

There are some additional code files for the generation of Pareto fronts and NSGA-II.

Codes for MOEA/D and NSGA-II are in subfolders './code/MOEA/D' and './code/NSGAII', respectively, using codes from platEMO.

Datasets

dataset files are in subfolder './datasets/'

- Dataset files for section V-C: Results on Benchmark and Real-world Problems are in subfolder './datasets/Experiments on Benchmark and Real-world Problems/'
 - Pareto front dataset files in Benchmark test suite are in subfolder './PF/'
 - Dataset files generated by MOEAs in Benchmark test suite are in subfolder './EMOA/'
 - Real-world problem dataset files are in subfolder './REAL-WORLD PROBLEM DATASETS/'
- Dataset files for section V-D: Scalability are in subfolder './datasets/Experiments on the Scalability/'
- Dataset files for section V-F: What If Considering More Advanced MOEAs? are in subfolder './datasets/Experiments of NSGAII and MOEA/D/'

weight vectors for R2 indicator and direction vectors for hypervolume approximation indicator are in in subfolder './datasets/WEIGHT MATRICES/'

How to run

You can run an algorithm by using the corresponding code files, the parameters including:

- 'PopObj': the dataset file of the candidate solutions, you can use any file in subfolder './code/datasets', e.g., the file './code/datasets/Experiments on Benchmark and Real-world Problems/PF/1K/data_set_concave_invertedtriangular_M3_1000.mat', where 'M3' and '1000' reveal the number of objectives and candidate solutions.
- 'selNum': the constraint on the number of selected solutions, e.g., 10.
- r: we defaultly use $r=1.1$ to set the relation between the reference point/Utopian point and the Pareto front.
- W: in GSEMO_{R2Tchebycheff}.m/LazyR2TchebycheffSelection.m, we need to input the weight matrix from subfolder './code/datasets/WEIGHT MATRICES/R2', e.g., W_R2_M3.mat for 3-objective problems. Similarly, in GSEMO_{HV}.m/GreedyHVSelection.m, we need to input the direction matrix from subfolder './code/datasets/WEIGHT MATRICES/HV', e.g., W_HV_M3.mat for 3-objective problems.

The returned 'Record' reveals the value of the quality indicator, and the returned 'Subset' is the subset chosen by the algorithm.

PS: deleteSolutions.m is used to choose the non-dominated solutions in the real-world dataset, i.e., allSolutions.txt.