A User Manual for the DHEA-Code

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February 27, 2008

The dhea-algorithm solves the Prize-Collecting Steiner Tree Problem (PCST) to provable optimality, by making usage of LEDA and CPLEX libraries. The code has been developed using non-commercial CPLEX/LEDA licences for academic purposes only.

The main features of the dhea-code are presented in the paper by:
I. Ljubić, R. Weiskircher, U. Pferschy, G. Klau, P. Mutzel, and M. Fischetti.
An algorithmic framework for the exact solution of the prize-collecting Steiner tree problem.
Mathematical Programming, Series B, 105(2-3):427-449, 2006.

1 Installation

1. We provide binaries for 64-bit/32-bit Linux machines.
2. Download the corresponding "dhea"-file from our web-page
   `http://homepage.univie.ac.at/ivana.ljubic/research/pcstp/64bit/dhea`
   or `http://homepage.univie.ac.at/ivana.ljubic/research/pcstp/32bit/dhea`
3. Copy the file into your local directory.
4. Make sure that you have valid CPLEX/LEDA licences and that you set up environment variables correctly (ILOG_LICENCE_FILE, LD_LIBRARY_PATH)
5. Type "mkdir sol" to make the default output directory.
6. Type "dhea -h" to get a list of parameters that can be used. Each parameter is explained as:
   name (*default_value*) [*interval*] *explanation*
7. Call it with "dhea [param_name param_value]. . ."

2 Parameters

There is a bunch of parameters that can be set differently than default values:

name	default value	range	explanation
FH	0	0	not in usage
FlowCuts	0	$\{0, 1\}$	Set to 1 if you want CPLEX to separate flow-cover inequalities
GomoryCuts	0	$\{0, 1\}$	Set to 1 if you want CPLEX to search for Gomory-cuts
HeurCutoff	0.5	$[0.5, 0.99]$	not in usage
VarSel	0	$\{0, 1, 2, 3, 4\}$	0: CPLEX decides automatically; 1: maximal infeasibility; 2: pseudo-costs; 3: strong branching; 4: pseudo-reduced costs. See CPLEX (*Index of Parameter Manual*) and the parameter *VarSel*.
asym	1	$\{0, 1\}$	Set to 1 if you want to use asymmetry constraints
chosenHeur	0	0	not in usage
cplexTimeLimit	1+e75	(0, 1+e75)	Time-limit for CPLEX in seconds
eps	0	$[0, 0.0001]$	ϵ-value for minimum-cardinalty cuts
fb	1	$\{0, 1\}$	Set to 1 if you want to use flow-balance constraints

name	default value	range	explanation
heurFreq	-1	$\{-1, 0, 1, \ldots\}$	Heuristic frequency: -1 off, 0 automatic, positive for frequency
idir	"."		input directory
ifile	"pcstp/K100.1"		input file
initConstr	1	$\{0, 1\}$	Set to 1 to use GSEC-constraints of size 2 in initialization
maxcuts	100	$\{1, 2, \ldots\}$	Do not insert more than .. cuts per variable in one iteration.
nested	2	$[0, 2]$	use nested cuts
no_subopt	1		number of suboptimal solutions that you want to give out
odir	"sol"		output directory
pc	1	1	not in usage
rev_flow	1	$\{0, 1\}$	Set to 1 to use reverse flow in the separation
rooted	0	$\{0, 1\}$	Unrooted (0) or rooted(1) instance
seed	0		seed value for the random number generator
set_seed	1	$\{0, 1\}$	Set to 1 to fix random seed
solutiondir	"sol"		solution directory
subopt_diff	-1	3	percentage of Hamming distance between solutions (-1 corresponds to minimal difference) when searching for most diversified suboptimal solution
tolerance	0		returned solution may be this percentage off an optimal solution