

```

1 "E:\1 \ \ \ \ \3 \ \ \ \ \ \1 \ \ \ \ \ \ \ \ \ \ \1 \ \ \ \ \ \ \ \ \ \ \ \1 \ \ \ \ \ \ \ \ \ \ \ \1 \_LW \ \ \ \ \ \4 \ \ \ \ \ \3 python_code\1 exzample\2 \ \ \ \ \ \ \ \ \ \ \ \9 Code for
  this paper\Scripts\python.exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=
  client --port=52157
2
3 import sys; print('Python %s on %s' % (sys.version, sys.platform))
4 sys.path.extend(['E:\1 \ \ \ \ \ \3 \ \ \ \ \ \ \ \ \ \ \ \1 \ \ \ \ \ \ \ \ \ \ \ \1 \_LW \ \ \ \ \ \4 \ \ \ \ \ \3 python_code\9 Code for this
  paper', 'E:/1 \ \ \ \ \ /3 \ \ \ \ \ /1 \ \ \ \ \ \ \ \ \ \ \ /1 \ \ \ \ \ \ \ \ \ \ \ /1 \_LW \ \ \ \ \ /4 \ \ \ \ \ /3 python_code/9 Code for this paper'])
5
6 PyDev console: starting.
7
8 Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
9 >>> runfile('E:/1 \ \ \ \ \ /3 \ \ \ \ \ /1 \ \ \ \ \ \ \ \ \ \ \ /1 \ \ \ \ \ \ \ \ \ \ \ /1 \_LW \ \ \ \ \ /4 \ \ \ \ \ /3 python_code/9 Code for this paper/
  main_RO_CCG.py', wdir='E:/1 \ \ \ \ \ /3 \ \ \ \ \ /1 \ \ \ \ \ \ \ \ \ \ \ /1 \ \ \ \ \ \ \ \ \ \ \ /1 \_LW \ \ \ \ \ /4 \ \ \ \ \ /3 python_code/9 Code for
  this paper')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
11 Waiting 5s.....
12 Set parameter MIPGap to value 1e-10
13 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
14
15 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
16 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
17
18 Optimize a model with 644962 rows, 64824 columns and 1819064 nonzeros
19 Model fingerprint: 0x82863e15
20 Variable types: 1 continuous, 64823 integer (64779 binary)
21 Coefficient statistics:
22   Matrix range    [1e+00, 1e+10]
23   Objective range [1e+00, 2e+01]
24   Bounds range   [1e+00, 1e+00]
25   RHS range      [1e+00, 2e+10]
26 Warning: Model contains large matrix coefficients
27 Warning: Model contains large rhs
28     Consider reformulating model or setting NumericFocus parameter
29     to avoid numerical issues.
30 Presolve removed 428716 rows and 34151 columns (presolve time = 5s) ...
31 Presolve removed 531943 rows and 45359 columns
32 Presolve time: 8.63s
33 Presolved: 113019 rows, 19465 columns, 304981 nonzeros
34 Variable types: 0 continuous, 19465 integer (19432 binary)
35
36 Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
37 Showing first log only...
38
39 Root relaxation presolved: 19465 rows, 132484 columns, 324446 nonzeros
40
41
42 Root simplex log...
43
44 Iteration   Objective    Primal Inf.   Dual Inf.    Time
45      0  5.5300000e+02  0.000000e+00  8.350000e+02   9s
46 Concurrent spin time: 0.02s
47
48 Solved with dual simplex (primal model)
49
50 Root relaxation: objective 5.530000e+02, 2205 iterations, 0.42 seconds (0.40 work units)
51 Total elapsed time = 10.05s
52
53   Nodes | Current Node | Objective Bounds | Work
54 Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
55
56      0  0 553.00000  0  8      - 553.00000  -  - 10s
57 H  0  0      553.0000000 553.00000 0.00% - 10s
58      0  0 553.00000  0  8 553.00000 553.00000 0.00% - 10s
59
60 Explored 1 nodes (6243 simplex iterations) in 10.37 seconds (18.95 work units)
61 Thread count was 8 (of 8 available processors)
62
63 Solution count 1: 553
64
65 Optimal solution found (tolerance 1.00e-10)
66 Best objective 5.5300000000000e+02, best bound 5.5300000000000e+02, gap 0.0000%
67 Set parameter MIPGap to value 1e-08
68 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
69
70 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
71 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
72
73 Optimize a model with 3645246 rows, 2881123 columns and 25540934 nonzeros
74 Model fingerprint: 0xb4e630a3
75 Variable types: 1422995 continuous, 1458128 integer (1450703 binary)
76 Coefficient statistics:
77   Matrix range    [1e-01, 1e+10]
78   Objective range [6e-05, 5e+01]
79   Bounds range    [1e+00, 8e+01]

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80  RHS range      [8e-01, 1e+10]
81  Warning: Model contains large matrix coefficients
82  Warning: Model contains large rhs
83      Consider reformulating model or setting NumericFocus parameter
84      to avoid numerical issues.
85  Presolve removed 3642026 rows and 2879733 columns (presolve time = 5s) ...
86  Presolve removed 3644073 rows and 2880702 columns
87  Presolve time: 7.68s
88  Presolved: 1173 rows, 421 columns, 3135 nonzeros
89  Variable types: 0 continuous, 421 integer (258 binary)
90  Found heuristic solution: objective 4065.0394527
91  Found heuristic solution: objective 4110.0394527
92
93  Root simplex log...
94
95  Iteration  Objective    Primal Inf.  Dual Inf.  Time
96      0  5.6910395e+03  4.299375e+02  0.000000e+00  10s
97    395  4.5860395e+03  0.000000e+00  0.000000e+00  10s
98
99  Root relaxation: objective 4.586039e+03, 395 iterations, 0.00 seconds (0.00 work units)
100
101  Nodes | Current Node | Objective Bounds | Work
102  Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
103
104  H  0  0          4586.0394527 6851.03945 49.4% - 9s
105    0  0      - 0  4586.03945 4586.03945 0.00% - 9s
106
107  Explored 1 nodes (596 simplex iterations) in 10.06 seconds (11.02 work units)
108  Thread count was 8 (of 8 available processors)
109
110  Solution count 3: 4586.04 4110.04 4065.04
111
112  Optimal solution found (tolerance 1.00e-08)
113  Best objective 4.586039452672e+03, best bound 4.586039452672e+03, gap 0.0000%
114  SP is solved
115  SP's optimal solution is'□4586
116
117  Itr = 0
118  Collect_LB = [553.0]
119  Collect_UB = [9725.078905344453]
120  Collect_Hua = [0.0]
121  Collect_SPObjVal = [4586.039452672227]
122  Collect_MPObjValNHua = [553.0]
123
124
125  Set parameter TimeLimit to value 7200
126  Set parameter MIPGap to value 0.05
127  Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
128
129  CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
130  Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
131
132  Optimize a model with 1436799 rows, 434457 columns and 4288516 nonzeros
133  Model fingerprint: 0xabdb667a
134  Variable types: 1 continuous, 434456 integer (420519 binary)
135  Coefficient statistics:
136  Matrix range      [1e-01, 1e+10]
137  Objective range    [1e+00, 2e+01]
138  Bounds range       [1e+00, 1e+00]
139  RHS range          [1e+00, 2e+10]
140  Warning: Model contains large matrix coefficients
141  Warning: Model contains large rhs
142      Consider reformulating model or setting NumericFocus parameter
143      to avoid numerical issues.
144  Presolve removed 1224534 rows and 407492 columns (presolve time = 5s) ...
145  Presolve removed 1279105 rows and 412505 columns (presolve time = 10s) ...
146  Presolve removed 1279105 rows and 412505 columns (presolve time = 15s) ...
147  Presolve removed 1326006 rows and 418524 columns
148  Presolve time: 16.48s
149  Presolved: 110793 rows, 15933 columns, 346852 nonzeros
150  Variable types: 1 continuous, 15932 integer (13439 binary)
151
152  Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
153  Showing first log only...
154
155  Root relaxation presolved: 15933 rows, 126726 columns, 362785 nonzeros
156
157
158  Root simplex log...
159
160  Iteration  Objective    Primal Inf.  Dual Inf.  Time
161      0  5.1461823e+03  0.000000e+00  7.526125e+03  17s
162  Concurrent spin time: 0.16s
163

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164 Solved with dual simplex (primal model)
165
166 Root relaxation: objective 5.146182e+03, 6864 iterations, 1.30 seconds (1.55 work units)
167 Total elapsed time = 20.26s
168
169   Nodes | Current Node | Objective Bounds | Work
170 Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
171
172   0   0 5146.18231   0 208   -5146.18231   -   - 21s
173   0   0 5146.18231   0 483   -5146.18231   -   - 23s
174   0   0 5146.18231   0 472   -5146.18231   -   - 23s
175   0   0 5146.18231   0 385   -5146.18231   -   - 24s
176   0   0 5146.18231   0 175   -5146.18231   -   - 28s
177   0   0 5146.18231   0 248   -5146.18231   -   - 28s
178   0   0 5146.18231   0 157   -5146.18231   -   - 31s
179   0   0 5146.18231   0 170   -5146.18231   -   - 32s
180   0   0 5146.18231   0 187   -5146.18231   -   - 34s
181   0   0 5146.18231   0 210   -5146.18231   -   - 34s
182   0   0 5146.18231   0 146   -5146.18231   -   - 36s
183   0   0 5146.18231   0 189   -5146.18231   -   - 37s
184   0   0 5146.18231   0 121   -5146.18231   -   - 39s
185   0   0 5146.18231   0 242   -5146.18231   -   - 40s
186   0   0 5146.18231   0 96    -5146.18231   -   - 42s
187   0   0 5146.18231   0 158   -5146.18231   -   - 42s
188   0   0 5146.18231   0 69    -5146.18231   -   - 44s
189   0   0 5146.18231   0 67    -5146.18231   -   - 44s
190   0   0 5146.18231   0 169   -5146.18231   -   - 44s
191   0   0 5146.18231   0 123   -5146.18231   -   - 47s
192   0   0 5146.18231   0 93    -5146.18231   -   - 48s
193 H   0   0           5146.1823098 5146.18231 0.00%   - 57s
194   0   0 5146.18231   0 93 5146.18231 5146.18231 0.00%   - 57s
195
196 Cutting planes:
197   Learned: 5
198   Gomory: 2
199   Cover: 485
200   Implied bound: 215
201   Clique: 2006
202   MIR: 142
203   StrongCG: 63
204   Flow cover: 20
205   GUB cover: 56
206   Zero half: 18
207   Network: 1
208   RLT: 71
209   Relax-and-lift: 428
210   BQP: 30
211   PSD: 6
212
213 Explored 1 nodes (116451 simplex iterations) in 57.66 seconds (117.93 work units)
214 Thread count was 8 (of 8 available processors)
215
216 Solution count 1: 5146.18
217
218 Optimal solution found (tolerance 5.00e-02)
219 Best objective 5.146182309815e+03, best bound 5.146182309815e+03, gap 0.0000%
220 Set parameter MIPGap to value 1e-08
221 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
222
223 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
224 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
225
226 Optimize a model with 3645246 rows, 2881123 columns and 25540934 nonzeros
227 Model fingerprint: 0xbd923ecc
228 Variable types: 1422995 continuous, 1458128 integer (1450703 binary)
229 Coefficient statistics:
230   Matrix range    [1e-01, 1e+10]
231   Objective range [6e-05, 5e+01]
232   Bounds range    [1e+00, 8e+01]
233   RHS range       [8e-01, 1e+10]
234 Warning: Model contains large matrix coefficients
235 Warning: Model contains large rhs
236   Consider reformulating model or setting NumericFocus parameter
237   to avoid numerical issues.
238 Presolve removed 3640785 rows and 2879399 columns (presolve time = 5s) ...
239 Presolve removed 3641396 rows and 2879782 columns
240 Presolve time: 7.29s
241 Presolved: 3850 rows, 1341 columns, 10283 nonzeros
242 Variable types: 10 continuous, 1331 integer (782 binary)
243 Found heuristic solution: objective 3696.4618664
244
245 Root simplex log...
246
247 Iteration   Objective       Primal Inf.   Dual Inf.     Time

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```
248      0  9.3040000e+03  4.138728e+03  0.000000e+00  9s
249    1146  5.0332444e+03  0.000000e+00  0.000000e+00  9s
250
251 Root relaxation: objective 5.033244e+03, 1146 iterations, 0.02 seconds (0.01 work units)
252
253 Nodes | Current Node | Objective Bounds | Work
254 Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
255
256      0   0 5033.24444   0 15 3696.46187 5033.24444 36.2% - 9s
257 H   0   0          5032.4444444 5033.24444 0.02% - 9s
258
259 Cutting planes:
260   Learned: 6
261   Gomory: 1
262
263 Explored 1 nodes (1620 simplex iterations) in 9.74 seconds (10.39 work units)
264 Thread count was 8 (of 8 available processors)
265
266 Solution count 2: 5032.44 3696.46
267
268 Optimal solution found (tolerance 1.00e-08)
269 Best objective 5.032444444444e+03, best bound 5.032444444444e+03, gap 0.0000%
270 SP is solved
271 SP's optimal solution is'□5032
272
273 Itr = 1
274 Collect_LB = [553.0, 5146.1823098150835]
275 Collect_UB = [9725.078905344453, 5592.587301587302]
276 Collect_Hua = [0.0, 4586.039452672227]
277 Collect_SPObjVal = [4586.039452672227, 5032.444444444445]
278 Collect_MPObjValNHua = [553.0, 560.1428571428569]
279
280
281 Set parameter TimeLimit to value 7200
282 Set parameter MIPGap to value 0.05
283 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
284
285 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
286 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
287
288 Optimize a model with 2220444 rows, 458514 columns and 6749721 nonzeros
289 Model fingerprint: 0x2f8b23b9
290 Variable types: 1 continuous, 458513 integer (430683 binary)
291 Coefficient statistics:
292   Matrix range [1e-01, 1e+10]
293   Objective range [1e+00, 2e+01]
294   Bounds range [1e+00, 1e+00]
295   RHS range [1e+00, 2e+10]
296 Warning: Model contains large matrix coefficients
297 Warning: Model contains large rhs
298   Consider reformulating model or setting NumericFocus parameter
299   to avoid numerical issues.
300 Presolve removed 1937562 rows and 424958 columns (presolve time = 5s) ...
301 Presolve removed 1997923 rows and 429512 columns (presolve time = 10s) ...
302 Presolve removed 2006776 rows and 430276 columns (presolve time = 18s) ...
303 Presolve removed 2006776 rows and 436285 columns (presolve time = 22s) ...
304 Presolve removed 2058760 rows and 436864 columns
305 Presolve time: 22.87s
306 Presolved: 161684 rows, 21650 columns, 539988 nonzeros
307 Variable types: 1 continuous, 21649 integer (16720 binary)
308
309 Deterministic concurrent LP optimizer: primal simplex, dual simplex, and barrier
310 Showing barrier log only...
311
312 Root relaxation presolved: 21650 rows, 183334 columns, 561638 nonzeros
313
314 Root barrier log...
315
316 Ordering time: 2.62s
317
318 Barrier statistics:
319   Dense cols : 35
320   Free vars : 786
321   AA' NZ : 5.695e+05
322   Factor NZ : 1.366e+07 (roughly 200 MB of memory)
323   Factor Ops : 2.581e+10 (roughly 1 second per iteration)
324   Threads : 1
325
326           Objective           Residual
327 Iter   Primal    Dual    Primal Dual   Compl Time
328   0 -4.91879034e+07 3.22044434e+04 2.30e+04 1.39e+03 7.73e+04 28s
329
330 Barrier performed 0 iterations in 28.20 seconds (48.62 work units)
331 Barrier solve interrupted - model solved by another algorithm
```

```

332
333 Concurrent spin time: 1.07s (can be avoided by choosing Method=3)
334
335 Solved with primal simplex
336
337 Root relaxation: objective 5.605444e+03, 24033 iterations, 4.66 seconds (5.56 work units)
338 Total elapsed time = 32.52s
339 Total elapsed time = 35.50s
340
341 Nodes | Current Node | Objective Bounds | Work
342 Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
343
344 0 0 5605.44444 0 514 - 5605.44444 - - 37s
345 0 0 5605.44444 0 512 - 5605.44444 - - 37s
346 0 0 5605.44444 0 767 - 5605.44444 - - 43s
347 0 0 5605.44444 0 849 - 5605.44444 - - 46s
348 0 0 5605.44444 0 256 - 5605.44444 - - 53s
349 0 0 5605.44444 0 233 - 5605.44444 - - 54s
350 0 0 5605.44444 0 274 - 5605.44444 - - 60s
351 0 0 5605.44444 0 313 - 5605.44444 - - 60s
352 0 0 5605.44444 0 291 - 5605.44444 - - 61s
353 0 0 5605.44444 0 283 - 5605.44444 - - 64s
354 0 0 5605.44444 0 381 - 5605.44444 - - 65s
355 0 0 5605.44444 0 172 - 5605.44444 - - 69s
356 0 0 5605.44444 0 245 - 5605.44444 - - 70s
357 0 0 5605.44444 0 128 - 5605.44444 - - 74s
358 0 0 5605.44444 0 125 - 5605.44444 - - 74s
359 0 0 5605.44444 0 203 - 5605.44444 - - 74s
360 0 0 5605.44444 0 126 - 5605.44444 - - 78s
361 0 0 5605.44444 0 126 - 5605.44444 - - 80s
362 H 0 0 5605.4444444 5605.44444 0.00% - 97s
363 0 0 5605.44444 0 126 5605.44444 5605.44444 0.00% - 97s
364
365 Cutting planes:
366 Learned: 28
367 Gomory: 4
368 Lift-and-project: 4
369 Cover: 474
370 Implied bound: 425
371 Clique: 2376
372 MIR: 183
373 StrongCG: 170
374 Flow cover: 139
375 GUB cover: 280
376 Zero half: 15
377 RLT: 113
378 Relax-and-lift: 431
379 BQP: 34
380 PSD: 2
381
382 Explored 1 nodes (182271 simplex iterations) in 97.19 seconds (214.24 work units)
383 Thread count was 8 (of 8 available processors)
384
385 Solution count 1: 5605.44
386
387 Optimal solution found (tolerance 5.00e-02)
388 Best objective 5.60544444444e+03, best bound 5.60544444444e+03, gap 0.0000%
389 Warning: linear constraint 653155 and linear constraint 1436800 have the same name "ConSP25_1[0,0]"
390 Set parameter MIPGap to value 1e-08
391 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
392
393 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
394 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
395
396 Optimize a model with 3645246 rows, 2881123 columns and 25540934 nonzeros
397 Model fingerprint: 0xe01d2462
398 Variable types: 1422995 continuous, 1458128 integer (1450703 binary)
399 Coefficient statistics:
400 Matrix range [1e-01, 1e+10]
401 Objective range [6e-05, 5e+01]
402 Bounds range [1e+00, 8e+01]
403 RHS range [8e-01, 1e+10]
404 Warning: Model contains large matrix coefficients
405 Warning: Model contains large rhs
406 Consider reformulating model or setting NumericFocus parameter
407 to avoid numerical issues.
408 Presolve removed 3640977 rows and 2879450 columns (presolve time = 5s) ...
409 Presolve removed 3641594 rows and 2879840 columns
410 Presolve time: 7.41s
411 Presolved: 3652 rows, 1283 columns, 9779 nonzeros
412 Variable types: 10 continuous, 1273 integer (757 binary)
413 Found heuristic solution: objective 3669.4348047
414
415 Root simplex log...

```

```

416
417 Iteration   Objective      Primal Inf.   Dual Inf.    Time
418      0 8.7840000e+03 2.960713e+03 0.000000e+00 9s
419 1137 5.0444444e+03 0.000000e+00 0.000000e+00 9s
420
421 Root relaxation: objective 5.044444e+03, 1137 iterations, 0.02 seconds (0.01 work units)
422
423 Nodes | Current Node | Objective Bounds | Work
424 Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
425
426 0 0 5044.44444 0 48 3669.43480 5044.44444 37.5% - 9s
427 0 0 5044.44444 0 46 3669.43480 5044.44444 37.5% - 9s
428 H 0 0 4025.6856262 5044.44444 25.3% - 9s
429 H 0 0 4209.1291096 5044.44444 19.8% - 9s
430 H 0 0 4735.4914569 5044.44444 6.52% - 9s
431 H 0 0 5016.6025680 5044.44444 0.55% - 9s
432 H 0 0 5019.4444444 5041.94249 0.45% - 9s
433 H 0 0 5019.7202709 5041.94249 0.44% - 9s
434 H 0 0 5036.3869376 5041.94249 0.11% - 9s
435 H 0 0 5039.7202709 5041.94249 0.04% - 9s
436 0 0 5039.72027 0 17 5039.72027 5039.72027 0.00% - 9s
437
438 Cutting planes:
439 Gomory: 8
440 Lift-and-project: 2
441 Cover: 5
442 Implied bound: 1
443 Clique: 41
444 MIR: 2
445 Flow cover: 4
446 Zero half: 15
447
448 Explored 1 nodes (2427 simplex iterations) in 10.14 seconds (10.36 work units)
449 Thread count was 8 (of 8 available processors)
450
451 Solution count 9: 5039.72 5036.39 5019.72 ... 3669.43
452
453 Optimal solution found (tolerance 1.00e-08)
454 Best objective 5.039720270938e+03, best bound 5.039720270938e+03, gap 0.0000%
455 SP is solved
456 SP's optimal solution is'□5039
457
458 Itr = 2
459 Collect_LB = [553.0, 5146.1823098150835, 5605.444444444445]
460 Collect_UB = [9725.078905344453, 5592.587301587302, 5592.587301587302]
461 Collect_Hua = [0.0, 4586.039452672227, 5032.444444444445]
462 Collect_SPObjVal = [4586.039452672227, 5032.444444444445, 5039.720270937742]
463 Collect_MPObjValNHua = [553.0, 560.1428571428569, 573.0]
464
465
466 Reach the termination conditions, stop iteration
467 Values adopted from the judgeCount's th iteration, and Itr = {2}, judgeCount = {1}
468
469 ~~~~~judgeCount = 1, SPObj_SPF = 5032.444444444445
470 Vessel i: 0: pi: 0-5, ai-di: 3-12, gi_SP-gpi_SP: 0.000000-0.000000, ai_SP-di: 3-12, taoi-deltai: 3-7, taoPi_SP-deltaPi_SP: 3-7, betaNi: 4, bi: 4
471 Vessel i: 1: pi: 10-15, ai-di: 4-25, gi_SP-gpi_SP: 0.000000-0.000000, ai_SP-di: 4-25, taoi-deltai: 4-18, taoPi_SP-deltaPi_SP: 4-18, betaNi: 14, bi: 14
472 Vessel i: 2: pi: 5-10, ai-di: 9-27, gi_SP-gpi_SP: 0.000000-0.000000, ai_SP-di: 9-27, taoi-deltai: 9-17, taoPi_SP-deltaPi_SP: 9-17, betaNi: 8, bi: 8
473 Vessel i: 3: pi: 22-27, ai-di: 9-30, gi_SP-gpi_SP: 0.000000-0.000000, ai_SP-di: 9-30, taoi-deltai: 9-17, taoPi_SP-deltaPi_SP: 9-17, betaNi: 8, bi: 8
474 Vessel i: 4: pi: 15-20, ai-di: 14-29, gi_SP-gpi_SP: 0.000000-0.000000, ai_SP-di: 14-29, taoi-deltai: 14-18, taoPi_SP-deltaPi_SP: 14-18, betaNi: 4, bi: 4
475 Vessel i: 5: pi: 28-34, ai-di: 16-28, gi_SP-gpi_SP: 0.000000-0.000000, ai_SP-di: 16-28, taoi-deltai: 16-26, taoPi_SP-deltaPi_SP: 16-26, betaNi: 10, bi: 10
476 Vessel i: 6: pi: 15-20, ai-di: 25-55, gi_SP-gpi_SP: 0.000000-1.000000, ai_SP-di: 25-55, taoi-deltai: 25-36, taoPi_SP-deltaPi_SP: 25-36, betaNi: 11, bi: 11
477 Vessel i: 7: pi: 28-34, ai-di: 32-60, gi_SP-gpi_SP: 1.000000-0.400000, ai_SP-di: 40-60, taoi-deltai: 38-46, taoPi_SP-deltaPi_SP: 40-46, betaNi: 8, bi: 8
478 Vessel i: 8: pi: 19-24, ai-di: 36-80, gi_SP-gpi_SP: 1.000000-0.600000, ai_SP-di: 46-80, taoi-deltai: 46-62, taoPi_SP-deltaPi_SP: 46-62, betaNi: 16, bi: 16
479 Vessel i: 9: pi: 24-29, ai-di: 41-67, gi_SP-gpi_SP: 0.600000-1.000000, ai_SP-di: 45-67, taoi-deltai: 47-58, taoPi_SP-deltaPi_SP: 47-58, betaNi: 11, bi: 11
480 Vessel i: 10: pi: 14-19, ai-di: 50-82, gi_SP-gpi_SP: 0.400000-0.000000, ai_SP-di: 52-82, taoi-deltai: 53-66, taoPi_SP-deltaPi_SP: 53-66, betaNi: 13, bi: 13
481
482 round LB = [553, 5146, 5605]
483 round UB = [9725, 5593, 5593]
484 round Hua = [0, 4586, 5032]
485 round SPObjVal = [4586, 5032, 5040]
486 round MPObjValNHua = [553, 560, 573]
487
488 Time: 858.000000

```

unknown

489
490
491
492