```
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=51449
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
     sys.path.extend(|'E:\\1 000\\3 0000\\1 00000\\1 000000\\1 00000\\1 LW 0000\\4 0000\\3 python code\\9 Code for this
     6
     PyDev console: starting.
     Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
 8
     >>> runfile('E:/1 000/3 0000/1 00000/1 00000/1 00000/1 00000/1 LW_000/4 000/3 python_code/9 Code for this paper/main_RO_BDC.py', wdir='E:/1 0000/3 0000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 000000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 000000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00
     this paper'
    Backend TkAgg is interactive backend. Turning interactive mode on.
     Waiting 5s.....
     Set parameter MIPGap to value 1e-10
12
     Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
13
15
     CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
     Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
16
17
     Optimize a model with 599385 rows, 52642 columns and 1660437 nonzeros
19
     Model fingerprint: 0xa7479769
     Variable types: 1 continuous, 52641 integer (52605 binary)
20
21
     Coefficient statistics:
      Matrix range [1e+00, 1e+10]
       Objective range [1e+00, 2e+01]
23
24
       Bounds range [1e+00, 1e+00]
                           [1e+00, 2e+10]
       RHS range
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 370756 rows and 24895 columns (presolve time = 5s) ...
     Presolve removed 370756 rows and 24895 columns (presolve time = 10s) ...
31
     Presolve removed 530972 rows and 37088 columns
     Presolve time: 11.22s
     Presolved: 68413 rows, 15554 columns, 230775 nonzeros
34
35
      Variable types: 0 continuous, 15554 integer (15527 binary)
     Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
37
38
     Showing first log only..
39
40
     Root relaxation presolved: 15554 rows, 83967 columns, 246329 nonzeros
41
42
43
     Root simplex log...
44
45
     Iteration Objective
                                      Primal Inf. Dual Inf.
                                                                        Time
           0 6.4700000e+02 0.000000e+00 9.240000e+02
46
47
     Concurrent spin time: 0.00s
48
     Solved with dual simplex (primal model)
49
50
51
     Root relaxation: objective 6.470000e+02, 2678 iterations, 0.37 seconds (0.31 work units)
52
53
         Nodes | Current Node | Objective Bounds
                                                                                  Work
54
      Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
55
         0 0 647.00000 0 12
56
                                                   - 647.00000
                                   1527.0000000 647.00000 57.6% - 12s
57 H 0 0
58 H 0 0
                                    947.0000000 647.00000 31.7% - 12s
59 H 0 0
                                   787.0000000 647.00000 17.8% - 13s
         0 0 647.00000 0 68 787.00000 647.00000 17.8% - 13s
60
61 H 0 0
                                   747.0000000 647.00000 13.4% - 14s
62 H 0
                                    727.0000000 647.00000 11.0%
63
         0 0 647.00000 0 67 727.00000 647.00000 11.0% - 14s
64 H 0 0
                                    707.0000000 647.00000 8.49% - 15s
                                    647.0000000 647.00000 0.00%
65
     H = 0
66
67
    Cutting planes:
68
       Gomory: 3
69
       Cover: 136
       Implied bound: 504
70
       Clique: 3
       MIR: 18
73
       StrongCG: 25
74
       GUB cover: 6
75
       RLT: 14
76
       Relax-and-lift: 2
     Explored 1 nodes (9739 simplex iterations) in 15.65 seconds (20.47 work units)
     Thread count was 8 (of 8 available processors)
```

```
80
 81
    Solution count 7: 647 707 727 ... 1527
 82
 83 Optimal solution found (tolerance 1.00e-10)
    Best objective 6.470000000000e+02, best bound 6.47000000000e+02, gap 0.0000%
    Set parameter MIPGap to value 1e-08
 85
 86 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
    CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
 88
    Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
 89
 90
 91
    Optimize a model with 2481817 rows, 1955335 columns and 17236672 nonzeros
 92
    Model fingerprint: 0xb52dcd18
    Variable types: 963295 continuous, 992040 integer (985965 binary)
 93
 94 Coefficient statistics:
     Matrix range [1e-01, 1e+10]
     Objective range [6e-05, 5e+01]
 96
     Bounds range [1e+00, 8e+01]
 97
 98
     RHS range
                    [8e-01, 1e+10]
     Warning: Model contains large matrix coefficients
100 Warning: Model contains large rhs
101
          Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
102
103 Presolve removed 2478064 rows and 1954050 columns (presolve time = 5s) ...
104 Presolve removed 2478819 rows and 1954269 columns
105 Presolve time: 6.21s
106 Presolved: 2998 rows, 1066 columns, 7940 nonzeros
107
    Variable types: 8 continuous, 1058 integer (626 binary)
108 Found heuristic solution: objective 3251.8528892
109 Found heuristic solution: objective 3465.7100450
110
111 Root simplex log...
112
113 Iteration Objective
                          Primal Inf. Dual Inf.
        0 7.7662796e+03 5.820592e+03 0.000000e+00
114
       1040 4.3839422e+03 0.000000e+00 0.000000e+00
115
116
117 Root relaxation: objective 4.383942e+03, 1040 iterations, 0.01 seconds (0.01 work units)
118
119
      Nodes | Current Node | Objective Bounds
                                                      Work
    Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
120
121
       0 \quad 0.4383.94217 \quad 0 \quad 22.3465.71005.4383.94217.26.5\%
122
123 H 0 0
                        4358.0671749 4383.94217 0.59% - 7s
                        4378.0671749 4383.94217 0.13%
124 H 0
       0 0 4383.17520 0 18 4378.06717 4383.17520 0.12% - 7s
125
       0 0 4383.17520 0 14 4378.06717 4383.17520 0.12% -
126
                                                                  7s
127
       0 0 4383.17520 0 9 4378.06717 4383.17520 0.12% -
128 H 0 0
                        4381.8528892 4383.17520 0.03%
129
130 Cutting planes:
131 Learned: 2
132
     MIR: 2
133
134 Explored 1 nodes (1936 simplex iterations) in 8.19 seconds (7.58 work units)
135 Thread count was 8 (of 8 available processors)
136
137 Solution count 5: 4381.85 4378.07 4358.07 ... 3251.85
138
139 Optimal solution found (tolerance 1.00e-08)
140 Best objective 4.381852889165e+03, best bound 4.381852889165e+03, gap 0.0000%
141 SP is solved
142 SP's optimal solution is' □4381
143
144
     Itr = 0
145 Collect_LB = [647.0]
146 Collect_UB = [9410.70577833071]
147 Collect Hua = [0.0]
148 Collect SPObjVal = [4381.852889165355]
149 Collect_MPObjValNHua = [647.0]
150
151
152 Set parameter TimeLimit to value 12000
153 Set parameter MIPGap to value 0.0005
154 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
155
156 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
157 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
158
159 Optimize a model with 604259 rows, 283978 columns and 1665365 nonzeros
160 Model fingerprint: 0x0b321475
161 Variable types: 1 continuous, 283977 integer (283941 binary)
162 Coefficient statistics:
     Matrix range [1e+00, 1e+10]
163
```

```
164
      Objective range [1e+00, 2e+01]
      Bounds range [1e+00, 1e+00]
165
                   [1e+00, 2e+10]
      RHS range
166
167
     Warning: Model contains large matrix coefficients
168 Warning: Model contains large rhs
169
          Consider reformulating model or setting NumericFocus parameter
          to avoid numerical issues.
170
171 Presolve removed 421045 rows and 262659 columns (presolve time = 5s) ...
172 Presolve removed 421045 rows and 262659 columns (presolve time = 10s) ...
173 Presolve removed 543268 rows and 274297 columns
174 Presolve time: 11.69s
175 Presolved: 60991 rows, 9681 columns, 155633 nonzeros
176 Variable types: 0 continuous, 9681 integer (9654 binary)
177 Root relaxation presolved: 9681 rows, 70672 columns, 165314 nonzeros
178
180 Root simplex log...
181
182 Iteration Objective
                           Primal Inf. Dual Inf.
                                                  Time
183
            handle free variables
                                              12s
184
             5.0288529e+03  0.000000e+00  0.000000e+00
                                                            13s
       7677 5.0288529e+03 0.000000e+00 0.000000e+00
185
186
187 Root relaxation: objective 5.028853e+03, 7677 iterations, 1.42 seconds (2.81 work units)
188
189
       Nodes | Current Node | Objective Bounds | Work
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
191
192
        0 0 5028.85289 0 14
                                    - 5028.85289
193 H 0 0
                        7148.8528892 5028.85289 29.7%
194
       0 0 5028.85289 0 71 7148.85289 5028.85289 29.7%
                       6808.8528892 5028.85289 26.1% - 15s
195 H 0 0
196
       0 \quad 0 \; 5028.85289 \;\; 0 \;\; 99 \; 6808.85289 \; 5028.85289 \;\; 26.1\% \quad \text{-} \;\; 15s
197
           0.5028.85289 \quad 0.100.6808.85289.5028.85289.26.1\%
198
           0 5028.85289 0 161 6808.85289 5028.85289 26.1%
                                                               - 18s
           0 5028.85289 0 117 6808.85289 5028.85289 26.1%
199
                                                               - 18s
200
       0
           0 5028.85289 0 89 6808.85289 5028.85289 26.1% - 20s
           0 5028.85289 0 120 6808.85289 5028.85289 26.1% - 20s
201
           0 5028.85289 0 53 6808.85289 5028.85289 26.1% - 21s
202
       0
203
       0 0 5028.85289 0 53 6808.85289 5028.85289 26.1% - 21s
204 H 0 0
                        5028.8528892 5028.85289 0.00% - 25s
205
       0 0 5028.85289 0 53 5028.85289 5028.85289 0.00%
206
207 Cutting planes:
208
     Learned: 2
209
     Gomory: 2
210
      Cover: 133
211
      Implied bound: 22
212
      Clique: 771
      MIR: 188
213
      StrongCG: 195
214
215
      GUB cover: 15
      Zero half: 5
216
217
      RLT: 1
218
      Relax-and-lift: 29
219
      BQP: 14
220
      PSD: 1
221
222 Explored 1 nodes (46536 simplex iterations) in 25.08 seconds (36.45 work units)
223 Thread count was 8 (of 8 available processors)
224
225 Solution count 3: 5028.85 6808.85 7148.85
226
227 Optimal solution found (tolerance 5.00e-04)
228 Best objective 5.028852889165e+03, best bound 5.028852889165e+03, gap 0.0000%
229
    Set parameter MIPGap to value 1e-08
230 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
231
232 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
233 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
234
235 Optimize a model with 2481817 rows, 1955335 columns and 17236672 nonzeros
236 Model fingerprint: 0x8092d0af
237 Variable types: 963295 continuous, 992040 integer (985965 binary)
238 Coefficient statistics:
     Matrix range [1e-01, 1e+10]
239
240 Objective range [6e-05, 5e+01]
241
      Bounds range [1e+00, 8e+01]
     RHS range
                    [8e-01, 1e+10]
242
243 Warning: Model contains large matrix coefficients
     Warning: Model contains large rhs
244
245
          Consider reformulating model or setting NumericFocus parameter
          to avoid numerical issues.
246
247 Presolve removed 2477831 rows and 1953979 columns (presolve time = 5s) ...
```

```
248 Presolve removed 2477934 rows and 1954006 columns
249 Presolve time: 5.94s
250 Presolved: 3883 rows, 1329 columns, 10423 nonzeros
251 Variable types: 8 continuous, 1321 integer (768 binary)
252
253 Root simplex log...
254
255 Iteration Objective
                           Primal Inf. Dual Inf.
                                                  Time
256
        0 \quad 8.7584085e + 03 \quad 3.968258e + 03 \quad 0.000000e + 00
257
       1103 4.7805672e+03 0.000000e+00 0.000000e+00
258
259 Root relaxation: objective 4.780567e+03, 1103 iterations, 0.01 seconds (0.01 work units)
260
       Nodes | Current Node | Objective Bounds
                                                      Work
261
262
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
263
                         4780.5671749 12131.7410 154% - 7s
264 H 0 0
                  - 0 4780.56717 4780.56717 0.00% - 7s
265
       0 0
266
267 Explored 1 nodes (1759 simplex iterations) in 7.74 seconds (7.23 work units)
268 Thread count was 8 (of 8 available processors)
269
270 Solution count 1: 4780.57
271
272 Optimal solution found (tolerance 1.00e-08)
273 Best objective 4.780567174880e+03, best bound 4.780567174880e+03, gap 0.0000%
274 SP is solved
275 SP's optimal solution is' □4780
276
277 Itr = 1
278 Collect LB = [647.0, 5028.852889165355]
279 Collect_UB = [9410.70577833071, 5427.567174879641]
280 Collect_Hua = [0.0, 4381.852889165355]
281 Collect_SPObjVal = [4381.852889165355, 4780.567174879641]
282 Collect MPObjValNHua = [647.0, 647.0]
283
284
285 Set parameter TimeLimit to value 12000
286 Set parameter MIPGap to value 0.0005
287 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
288
289 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
290 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
291
292 Optimize a model with 604260 rows, 283978 columns and 1665384 nonzeros
293 Model fingerprint: 0xc91ffb34
294 Variable types: 1 continuous, 283977 integer (283941 binary)
295 Coefficient statistics:
296 Matrix range [1e+00, 1e+10]
297
     Objective range [1e+00, 2e+01]
298
      Bounds range [1e+00, 1e+00]
                   [1e+00, 2e+10]
299
     RHS range
300 Warning: Model contains large matrix coefficients
     Warning: Model contains large rhs
301
302
          Consider reformulating model or setting NumericFocus parameter
303
          to avoid numerical issues.
304 Presolve removed 421495 rows and 262706 columns (presolve time = 5s) ...
305 Presolve removed 421495 rows and 262706 columns (presolve time = 10s) ...
306 Presolve removed 543523 rows and 274334 columns
307 Presolve time: 11.69s
308 Presolved: 60737 rows, 9644 columns, 155020 nonzeros
309 Variable types: 0 continuous, 9644 integer (9617 binary)
310 Root relaxation presolved: 9644 rows, 70381 columns, 164664 nonzeros
311
312
313 Root simplex log...
314
315 Iteration Objective
                           Primal Inf. Dual Inf.
                                                  Time
                                              12s
316
            handle free variables
       7952
             5.4418529e+03 0.000000e+00 0.000000e+00
317
       7952 5.4418529e+03 0.000000e+00 0.000000e+00
318
                                                            13s
319
320 Root relaxation: objective 5.441853e+03, 7952 iterations, 1.27 seconds (2.40 work units)
321
       Nodes | Current Node | Objective Bounds
                                                      Work
322
323
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
324
325
           0 5441.85289 0 23
                                    - 5441.85289
                                                   - - 13s
326
           0 5441.85289 0 45
                                    - 5441.85289
       0
                                                   - - 14s
327
           0 5441.85289 0 263
                                     - 5441.85289
                                                        - 15s
328
           0 5441.85289
                          0 262
                                     - 5441.85289
                                                        - 15s
           0 5441.85289 0 177
                                                   - - 18s
329
                                     - 5441.85289
       0
           0 5441.85289 0 276
                                     - 5441.85289
330
       0
                                                   - - 18s
       0
           0 5441.85289 0 270
                                     - 5441.85289
                                                        - 18s
331
```

```
332
           0 5441.85289 0 89
                                    - 5441.85289
                                                         20s
       0
333
       0 \quad 0.5441.85289 \quad 0.180
                                    - 5441.85289
       0 0 5441.85289 0 74
                                    - 5441.85289
334
                                                   - - 21s
                       9521.8528892 5441.85289 42.8%
335 H 0 0
       0 0 5441.85289 0 66 9521.85289 5441.85289 42.8%
336
                        7821.8528892 5441.85289 30.4% - 22s
337 H 0 0
                        5441.8528892 5441.85289 0.00% - 25s
338 H 0 0
339
       0 0 5441.85289 0 66 5441.85289 5441.85289 0.00% - 25s
340
341 Cutting planes:
342
    Learned: 1
343
     Gomory: 1
344
     Cover: 217
     Implied bound: 22
345
346
     Clique: 801
     MIR: 92
347
348
     StrongCG: 102
349
     GUB cover: 20
350
     Zero half: 3
351
     RLT: 2
352
     Relax-and-lift: 6
353
     BQP: 5
354
355 Explored 1 nodes (37786 simplex iterations) in 25.05 seconds (34.28 work units)
356 Thread count was 8 (of 8 available processors)
357
358 Solution count 3: 5441.85 7821.85 9521.85
359
360 Optimal solution found (tolerance 5.00e-04)
361 Best objective 5.441852889165e+03, best bound 5.441852889165e+03, gap 0.0000%
362 Set parameter MIPGap to value 1e-08
363 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
364
    CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
365
366 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
367
368 Optimize a model with 2481817 rows, 1955335 columns and 17236672 nonzeros
369 Model fingerprint: 0xd16502a1
370 Variable types: 963295 continuous, 992040 integer (985965 binary)
371 Coefficient statistics:
372 Matrix range [1e-01, 1e+10]
373
     Objective range [6e-05, 5e+01]
     Bounds range [1e+00, 8e+01]
374
375
     RHS range
                   [8e-01, 1e+10]
376 Warning: Model contains large matrix coefficients
377 Warning: Model contains large rhs
378
          Consider reformulating model or setting NumericFocus parameter
379
         to avoid numerical issues.
380 Presolve removed 2477570 rows and 1953909 columns (presolve time = 5s) ...
381 Presolve removed 2477571 rows and 1953909 columns
382 Presolve time: 5.47s
383 Presolved: 4246 rows, 1426 columns, 11305 nonzeros
384 Variable types: 8 continuous, 1418 integer (820 binary)
385 Found heuristic solution: objective 3388.5671749
386
387 Root simplex log...
388
389 Iteration Objective
                          Primal Inf. Dual Inf.
390
        0 \quad 8.8334085e + 03 \quad 3.925988e + 03 \quad 0.000000e + 00
391
       1242 4.7655672e+03 0.000000e+00 0.000000e+00
392
393 Root relaxation: objective 4.765567e+03, 1242 iterations, 0.01 seconds (0.01 work units)
394
395
      Nodes | Current Node | Objective Bounds
                                                      Work
396
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
397
                        4765.5671749 12906.7410 171% - 6s
398 H 0 0
399
       0 0
                  - 0
                        4765.56717 4765.56717 0.00% - 6s
400
401 Explored 1 nodes (1637 simplex iterations) in 7.25 seconds (7.04 work units)
402 Thread count was 8 (of 8 available processors)
403
404 Solution count 2: 4765.57 3388.57
405
406 Optimal solution found (tolerance 1.00e-08)
407 Best objective 4.765567174880e+03, best bound 4.765567174880e+03, gap 0.0000%
408 SP is solved
409 SP's optimal solution is' □4765
410
411 Itr = 2
412 Collect LB = [647.0, 5028.852889165355, 5441.852889165355]
413 Collect_UB = [9410.70577833071, 5427.567174879641, 5426.852889165355]
414 Collect_Hua = [0.0, 4381.852889165355, 4780.567174879641]
415 Collect_SPObjVal = [4381.852889165355, 4780.567174879641, 4765.567174879641]
```

```
unknown
416 Collect_MPObjValNHua = [647.0, 647.0, 661.2857142857138]
417
418
419 Ops, stop iteration
420 Values adopted from the Itr-1' th iteration, and Itr = {2}, judgeCount = {1}
421
          judgeCount = 1, SPObj_SPF = 4780.567174879641
422
423 Vessel i: 0:
                   pi: 0-5, ai-di: 8-25,
                                           gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                  ai_SP-di: 8-25,
                                                                                                  taoi-deltai: 8-17,
                                                                                                                      taoPi_SP-deltaPi_SP: 8-17,
                                                                                                                                                    betaNi: 9,
      bi: 9
424
     Vessel i: 1:
                    pi: 5-10, ai-di: 3-21, gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                                                        taoPi_SP-deltaPi_SP: 6-15, betaNi: 12
                                                                                   ai_SP-di: 3-21,
                                                                                                    taoi-deltai: 3-15,
          bi: 12
425
     Vessel i: 2:
                    pi: 12-17,
                                ai-di: 13-36,
                                                gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                     ai_SP-di: 13-36,
                                                                                                        taoi-deltai: 13-28,
                                                                                                                            taoPi_SP-deltaPi_SP: 13-28,
                    bi: 15
      betaNi: 15,
426
                    pi: 6-12,
                               ai-di: 22-49,
                                              gi_SP-gpi_SP: 0.000000-0.000000,
     Vessel i: 3:
                                                                                    ai_SP-di: 22-49,
                                                                                                       taoi-deltai: 22-39,
                                                                                                                           taoPi_SP-deltaPi_SP: 22-39,
                                                                                                                                                          betaNi
      : 17, bi: 17
      Vessel i: 4:
                    pi: 28-34,
                                                gi SP-gpi SP: 0.000000-0.000000,
                                                                                                        taoi-deltai: 35-48,
                                                                                                                            taoPi SP-deltaPi SP: 35-48,
                                 ai-di: 35-57,
                                                                                     ai SP-di: 35-57,
                    bi: 13
      betaNi: 13.
428
                                 ai-di: 3-35,
                                               gi_SP-gpi_SP: 0.257143-0.800000,
                                                                                    ai_SP-di: 4-35,
                                                                                                      taoi-deltai: 6-21,
                                                                                                                         taoPi_SP-deltaPi_SP: 6-21, betaNi: 15
      Vessel i: 5:
                    pi: 27-34,
          bi: 15
429
      Vessel i: 6:
                    pi: 18-23,
                                ai-di: 2-29,
                                              gi_SP-gpi_SP: 1.000000-0.000000,
                                                                                    ai SP-di: 10-29,
                                                                                                       taoi-deltai: 7-15,
                                                                                                                          taoPi_SP-deltaPi_SP: 10-15,
                                                                                                                                                        betaNi:
      8. bi: 8
430
      Vessel i: 7:
                    pi: 14-21,
                                 ai-di: 27-68,
                                                gi_SP-gpi_SP: 1.000000-0.600000,
                                                                                     ai_SP-di: 37-68,
                                                                                                        taoi-deltai: 37-53,
                                                                                                                            taoPi_SP-deltaPi_SP: 37-53,
      betaNi: 16,
                    bi: 16
     Vessel i: 8:
                    pi: 14-20,
                                 ai-di: 29-59,
                                               gi SP-gpi SP: 0.142857-1.000000,
                                                                                     ai SP-di: 30-59,
                                                                                                        taoi-deltai: 30-35,
                                                                                                                            taoPi SP-deltaPi SP: 30-35,
                  bi: 5
      betaNi: 5,
432
433 round LB = [647, 5029, 5442]
434 round UB = [9411, 5428, 5427]
435 round Hua = [0, 4382, 4781]
436 round SPObjVal = [4382, 4781, 4766]
437 round MPObjValNHua = [647, 647, 661]
438
439 OptimalObj = 5441.852889165355
440 Time: 568.000000
441
442
443
444
```