```
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=2373
 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 0000/3 00000/1 000000/1 000000/1 000000/1 LW _0000/4 0000/3 python_code/9 Code for this paper/main_RO_TWS.py', wdir='E:/1 0000/3 00000/1 000000/1 000000/1 000000/1 LW _0000/4 0000/3 python_code/9 Code for
   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 557467 rows, 58701 columns and 1576383 nonzeros
19
   Model fingerprint: 0xaf759b0a
   Variable types: 1 continuous, 58700 integer (58660 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 342574 rows and 28008 columns (presolve time = 5s) ...
   Presolve removed 342574 rows and 28008 columns (presolve time = 10s) ...
31
   Presolve removed 444834 rows and 38927 columns
   Presolve time: 11.60s
   Presolved: 112633 rows, 19774 columns, 307906 nonzeros
34
35
   Variable types: 0 continuous, 19774 integer (19744 binary)
   Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
37
38
   Showing first log only..
39
   Root relaxation presolved: 19774 rows, 132407 columns, 327680 nonzeros
40
41
42
43
   Root simplex log...
44
45
   Iteration Objective
                        Primal Inf. Dual Inf.
                                              Time
       0 6.4900000e+02 0.000000e+00 9.500000e+02
46
                                                      13s
47
   Concurrent spin time: 0.00s
48
   Solved with dual simplex (primal model)
49
50
   Root relaxation: objective 6.490000e+02, 2260 iterations, 0.66 seconds (0.44 work units)
51
52
53
     Nodes | Current Node | Objective Bounds
                                                     Work
54
    Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
55
         0 649 00000 0 28
56
      0
                                 - 649 00000
                                               - - 13s
57
      0
         0 649.00000 0 91
                                 - 649.00000
                                                  - 14s
58
         0 649.00000 0 84
                                 - 649.00000
59 H 0 0
                      4029.0000000 649.00000 83.9% - 15s
60
   Н
      0
          0
                      1789.0000000 649.00000 63.7% - 15s
61
      0
                       709.0000000 649.00000 8.46%
   Η
         0 649.00000 0 188 709.00000 649.00000 8.46% - 16s
62
      0
         0 649,00000 0 15 709.00000 649,00000 8.46% - 21s
63
      0
64 H 0
                       649.0000000 649.00000 0.00% - 21s
65
66
   Cutting planes:
67
    Gomory: 3
68
    Cover: 75
    Implied bound: 1
69
70
    MIR: 49
    StrongCG: 50
    GUB cover: 1
73
    Zero half: 4
74
    Relax-and-lift: 3
76
   Explored 1 nodes (10906 simplex iterations) in 21.79 seconds (29.16 work units)
   Thread count was 8 (of 8 available processors)
78
   Solution count 4: 649 709 1789 4029
79
```

```
80
 81 Optimal solution found (tolerance 1.00e-10)
    Best objective 6.490000000000e+02, best bound 6.49000000000e+02, gap 0.0000%
    Set parameter MIPGap to value 1e-08
 84 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
 86 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
 87 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
 88
 89 Optimize a model with 654090 rows, 16030 columns and 1337378 nonzeros
 90 Model fingerprint: 0xd5c55a0f
    Variable types: 40 continuous, 15990 integer (9240 binary)
 92 Coefficient statistics:
 93
      Matrix range [1e-01, 1e+10]
 94
      Objective range [6e-05, 5e+01]
      Bounds range [1e+00, 1e+00]
      RHS range
                    [8e-01, 1e+10]
 96
     Warning: Model contains large matrix coefficients
 97
 98 Warning: Model contains large rhs
          Consider reformulating model or setting NumericFocus parameter
100
          to avoid numerical issues.
101 Presolve removed 651769 rows and 15144 columns
102 Presolve time: 0.59s
103 Presolved: 2321 rows, 886 columns, 6181 nonzeros
104 Variable types: 10 continuous, 876 integer (524 binary)
105 Found heuristic solution: objective 3987.9062900
106
107 Root relaxation: objective 5.008444e+03, 732 iterations, 0.00 seconds (0.01 work units)
108
109
       Nodes | Current Node | Objective Bounds
110 Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
111
112
       0 0 5008.44444 0 26 3987.90629 5008.44444 25.6%
113 H 0 0
                         5008.3015873 5008.44444 0.00% - 0s
114
115 Cutting planes:
116
      Learned: 4
117
      Gomory: 1
118
      Cover: 4
119
      Implied bound: 7
120
      MIR: 7
121
122 Explored 1 nodes (1165 simplex iterations) in 0.81 seconds (0.86 work units)
123 Thread count was 8 (of 8 available processors)
124
125 Solution count 2: 5008.3 3987.91
126
127 Optimal solution found (tolerance 1.00e-08)
128 Best objective 5.008301587302e+03, best bound 5.008301587302e+03, gap 0.0000%
129 SP is solved
130 SP's optimal solution is' □ 5008
131
132 Itr = 0
133 Collect LB = [649.0]
134 Collect_UB = [10665.603174603188]
135 Collect Hua = [0.0]
136 Collect SPObjVal = [5008.301587301594]
137 Collect_MPObjValNHua = [649.0]
138
139
140 Set parameter MIPGap to value 1e-10
141 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
142
143 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
144 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
145
146 Optimize a model with 566498 rows, 344301 columns and 1585459 nonzeros
147 Model fingerprint: 0xeb29b40a
148 Variable types: 1 continuous, 344300 integer (344260 binary)
149 Coefficient statistics:
150 Matrix range [1e+00, 1e+10]
151
      Objective range [1e+00, 2e+01]
      Bounds range [1e+00, 1e+00]
RHS range [1e+00, 2e+10]
152
153
     RHS range
154 Warning: Model contains large matrix coefficients
155 Warning: Model contains large rhs
156
          Consider reformulating model or setting NumericFocus parameter
157
          to avoid numerical issues.
158 Presolve removed 414856 rows and 324178 columns (presolve time = 5s) ...
159 Presolve removed 414856 rows and 324178 columns (presolve time = 10s) ...
160 Presolve removed 512796 rows and 334811 columns
161 Presolve time: 11.76s
162 Presolved: 53702 rows, 9490 columns, 140676 nonzeros
163 Variable types: 0 continuous, 9490 integer (9460 binary)
```

```
164 Root relaxation presolved: 9490 rows, 63192 columns, 150166 nonzeros
165
166
167 Root simplex log...
168
169 Iteration Objective
                           Primal Inf. Dual Inf.
                                                 Time
170
            handle free variables
                                             12s
       6928 5.6644444e+03 0.000000e+00 0.000000e+00
171
       6928 5.6644444e+03 0.000000e+00 0.000000e+00
172
173
174 Root relaxation: objective 5.664444e+03, 6928 iterations, 1.74 seconds (2.54 work units)
175
176
       Nodes | Current Node | Objective Bounds
                                                      Work
177
     Expl\ Unexpl\ |\ Obj\ Depth\ IntInf\ |\ Incumbent \quad BestBd\ Gap\ |\ It/Node\ Time
178
179
           0 5664.44444 0 11
                                    - 5664,44444
180 H 0 0
                       6324.4444444 5664.44444 10.4% - 15s
       0 0 5664.44444 0 120 6324.44444 5664.44444 10.4% - 15s
181
182 H 0 0
                       6044.4444444 5664.44444 6.29% - 16s
183
       0 0 5664.44444 0 34 6044.44444 5664.44444 6.29%
       0 0 5664.44444 0 33 6044.44444 5664.44444 6.29% - 17s
184
       0 \quad 0 \; 5664.44444 \quad 0 \; \; 56 \; 6044.44444 \; 5664.44444 \; \; 6.29\% \quad \text{-} \quad 17s
185
186 H 0 0
                       5864.4444444 5664.44444 3.41% - 18s
       0 0 5664.44444 0 61 5864.44444 5664.44444 3.41% - 18s
187
           0 5664.44444 0 174 5864.44444 5664.44444 3.41%
188
                                                               - 18s
189
       0
           0 5664.44444 0 25 5864.44444 5664.44444 3.41% - 19s
           0 5664.44444 0 164 5864.44444 5664.44444 3.41% - 20s
190
191
           0 5664.44444 0 160 5864.44444 5664.44444 3.41%
       0
                                                               - 20s
           0 5664.44444 0 160 5864.44444 5664.44444 3.41%
192
       0
                                                               - 20s
193
           0 5664.44444 0 75 5864.44444 5664.44444 3.41% - 20s
194
       0
           0 5664.44444 0 72 5864.44444 5664.44444 3.41%
                                                               - 21s
195
           0.5664.44444 0.119.5864.44444.5664.44444 3.41%
       0
                                                               - 21s
196
       0 \quad 0 \; 5664.44444 \quad 0 \; \; 118 \; 5864.44444 \; 5664.44444 \; \; 3.41\%
                                                               - 21s
197 H 0 0
                       5664.4444444 5664.44444 0.00% - 22s
198
       0 0 5664.44444 0 69 5664.44444 5664.44444 0.00% - 22s
199
200 Cutting planes:
201
     Learned: 2
202
      Gomory: 3
203
      Cover: 120
204
      Implied bound: 1200
205
      Clique: 285
      MIR: 71
206
207
      StrongCG: 45
208
      GUB cover: 8
209
      Zero half: 11
210
     RLT: 42
      Relax-and-lift: 8
211
212
     BQP: 6
213
     PSD: 2
214
215 Explored 1 nodes (40964 simplex iterations) in 22.08 seconds (24.12 work units)
216 Thread count was 8 (of 8 available processors)
217
218 Solution count 4: 5664.44 5864.44 6044.44 6324.44
219
220 Optimal solution found (tolerance 1.00e-10)
221 Best objective 5.66444444444e+03, best bound 5.6644444444e+03, gap 0.0000%
222
     Set parameter MIPGap to value 1e-08
223 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
224
225 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
226 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
227
228 Optimize a model with 654090 rows, 16030 columns and 1337378 nonzeros
229 Model fingerprint: 0x998347ad
230 Variable types: 40 continuous, 15990 integer (9240 binary)
231 Coefficient statistics:
232
     Matrix range [1e-01, 1e+10]
233
      Objective range [6e-05, 5e+01]
234
     Bounds range [1e+00, 1e+00]
235
     RHS range
                    [8e-01, 1e+10]
236
     Warning: Model contains large matrix coefficients
237
     Warning: Model contains large rhs
238
          Consider reformulating model or setting NumericFocus parameter
239
          to avoid numerical issues.
240 Presolve removed 649496 rows and 14518 columns
241 Presolve time: 0.55s
242 Presolved: 4594 rows, 1512 columns, 12213 nonzeros
243 Variable types: 10 continuous, 1502 integer (875 binary)
244 Found heuristic solution: objective 4059.8240692
245
246 Root relaxation: objective 5.617444e+03, 1387 iterations, 0.02 seconds (0.02 work units)
247
```

```
248
       Nodes | Current Node | Objective Bounds
                                                          Work
249
    Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
250
       0 \quad 0 \ 5617.44444 \quad 0 \quad 40 \ 4059.82407 \ 5617.44444 \ \ 38.4\%
251
252 H 0 0
                        4579.6044479 5617.44444 22.7% - 0s
253 H 0 0
                         5081.6470308 5617.44444 10.5%
       0 \quad 0 \ 5617.44444 \quad 0 \quad 39 \ 5081.64703 \ 5617.44444 \ \ 10.5\% \quad \text{-}
254
255 H 0 0
                         5299.6470308 5617.44444 6.00% - 0s
                         5614.0544382 5617.44444 0.06%
256 H 0 0
       0 0 5617.17864 0 20 5614.05444 5617.17864 0.06%
257
258
259 Cutting planes:
260
     Cover: 3
261
      Clique: 12
262
      MIR: 3
263
     Flow cover: 2
264
      Zero half: 3
265
      RLT: 2
266
267 Explored 1 nodes (2390 simplex iterations) in 0.95 seconds (0.97 work units)
268 Thread count was 8 (of 8 available processors)
269
270 Solution count 5: 5614.05 5299.65 5081.65 ... 4059.82
271
272 Optimal solution found (tolerance 1.00e-08)
273 Best objective 5.614054438168e+03, best bound 5.614054438168e+03, gap 0.0000%
274 SP is solved
275 SP's optimal solution is' ☐ 5614
276
277 Itr = 1
278 Collect LB = [649.0, 5664.44444444451]
279 Collect UB = [10665.603174603188, 6270.197295310603]
280 Collect_Hua = [0.0, 5008.301587301594]
    Collect_SPObjVal = [5008.301587301594, 5614.054438167746]
282 Collect MPObjValNHua = [649.0, 656.1428571428569]
283
284
285 Set parameter MIPGap to value 1e-10
286 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
287
288 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
289 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
290
291 Optimize a model with 566498 rows, 344301 columns and 1585459 nonzeros
292 Model fingerprint: 0x163d5724
293 Variable types: 1 continuous, 344300 integer (344260 binary)
294 Coefficient statistics:
295
     Matrix range [1e+00, 1e+10]
296
      Objective range [1e+00, 2e+01]
      Bounds range [1e+00, 1e+00]
297
298
      RHS range
                    [1e+00, 2e+10]
299 Warning: Model contains large matrix coefficients
300 Warning: Model contains large rhs
301
          Consider reformulating model or setting NumericFocus parameter
302
          to avoid numerical issues.
303 Presolve removed 415071 rows and 324162 columns (presolve time = 5s) ...
304 Presolve removed 415071 rows and 324162 columns (presolve time = 10s) ...
305 Presolve removed 512999 rows and 334836 columns
306 Presolve time: 12.13s
307 Presolved: 53499 rows, 9465 columns, 140196 nonzeros
    Variable types: 0 continuous, 9465 integer (9435 binary)
308
309 Root relaxation presolved: 9465 rows, 62964 columns, 149661 nonzeros
310
311
312 Root simplex log...
313
314 Iteration Objective
                           Primal Inf. Dual Inf.
                                                  Time
315
            handle free variables
                                              13s
       6991 \quad 6.2790544e{+03} \quad 0.000000e{+00} \quad 0.000000e{+00}
316
                                                           15s
317
       6991 6.2790544e+03 0.000000e+00 0.000000e+00
318
319 Root relaxation: objective 6.279054e+03, 6991 iterations, 1.95 seconds (2.34 work units)
320
321
       Nodes | Current Node | Objective Bounds
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
322
323
324
           0 6279.05444 0 29
                                    - 6279.05444
325
       0
           0 6279.05444 0 29
                                    - 6279.05444
                                                   - - 15s
           0.6279.05444 0.96
                                    - 6279 05444
                                                      - 15s
326
       0
327
           0 6279.05444
                          0 91
                                    - 6279.05444
                                                       - 15s
                                    - 6279.05444
                                                       - 17s
328
           0.6279.05444 \quad 0.68
                                     - 6279.05444
                                                       - 18s
329
       0
           0 6279.05444 0 102
                        6299.0544382 6279.05444 0.32% - 20s
330 H 0 0
           331
```

```
332 H 0 0
                        6279.0544382 6279.05444 0.00% - 21s
333
        0 0 6279.05444 0 26 6279.05444 6279.05444 0.00% - 21s
334
335 Cutting planes:
336
     Learned: 1
337
      Gomory: 5
338
      Cover: 68
339
      Implied bound: 1057
340
      Clique: 224
341
      MIR: 22
342
      StrongCG: 13
343
      GUB cover: 2
344
      Zero half: 8
345
      RLT: 2
346
      Relax-and-lift: 201
347
348 Explored 1 nodes (25706 simplex iterations) in 21.46 seconds (21.83 work units)
349 Thread count was 8 (of 8 available processors)
350
351 Solution count 2: 6279.05 6299.05
352
353 Optimal solution found (tolerance 1.00e-10)
354 Best objective 6.279054438168e+03, best bound 6.279054438168e+03, gap 0.0000%
355 Set parameter MIPGap to value 1e-08
356 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
357
358 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
359 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
360
361 Optimize a model with 654090 rows, 16030 columns and 1337378 nonzeros
362 Model fingerprint: 0x4c1a75f9
363 Variable types: 40 continuous, 15990 integer (9240 binary)
364 Coefficient statistics:
      Matrix range [1e-01, 1e+10]
365
      Objective range [6e-05, 5e+01]
366
      Bounds range [1e+00, 1e+00]
367
368
      RHS range
                   [8e-01, 1e+10]
369 Warning: Model contains large matrix coefficients
370 Warning: Model contains large rhs
371
          Consider reformulating model or setting NumericFocus parameter
372
          to avoid numerical issues.
373 Presolve removed 649351 rows and 14432 columns
374 Presolve time: 0.63s
375 Presolved: 4739 rows, 1598 columns, 12573 nonzeros
376
    Variable types: 10 continuous, 1588 integer (927 binary)
377 Found heuristic solution: objective 4046.4907358
378
379 Root relaxation: objective 5.713444e+03, 1368 iterations, 0.02 seconds (0.01 work units)
380
381
       Nodes | Current Node | Objective Bounds

↓ Work

382
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
383
           0 5713.44444 0 22 4046.49074 5713.44444 41.2%
384
                         5155.0187770 5713.44444 10.8%
385 H 0 0
386 H 0
                         5558.9076659 5713.44444 2.78%
                         5578.9076659 5713.44444 2.41%
387 H 0
        0 0 5713.44444 0 16 5578.90767 5713.44444 2.41% -
388
                                                                   0s
       0 \quad 0 \ 5713.44444 \quad 0 \quad 18 \ 5578.90767 \ 5713.44444 \ \ 2.41\%
389
390 H 0 0
                         5678.3928106 5713.44444 0.62% - 0s
391 H 0 0
                         5708.3928106 5713.44444 0.09%
392
       0 \quad 0.5708.39281 \quad 0 \quad 16.5708.39281.5708.39281.0.00\%
393
394 Cutting planes:
395
      Gomory: 5
396
      Cover: 5
397
      Implied bound: 1
398
      Clique: 24
399
      MIR · 1
400
      Flow cover: 1
401
      Zero half: 2
402
      RLT: 1
403
404 Explored 1 nodes (2593 simplex iterations) in 0.99 seconds (0.96 work units)
405 Thread count was 8 (of 8 available processors)
406
407 Solution count 6: 5708.39 5678.39 5578.91 ... 4046.49
408
409 Optimal solution found (tolerance 1.00e-08)
410 Best objective 5.708392810563e+03, best bound 5.708392810563e+03, gap 0.0000%
411 SP is solved
412 SP's optimal solution is' □ 5708
413
414 	ext{ Itr} = 2
415 Collect_LB = [649.0, 5664.44444444451, 6279.054438167746]
```

```
416 Collect UB = [10665.603174603188, 6270.197295310603, 6270.197295310603]
417 Collect Hua = [0.0, 5008.301587301594, 5614.054438167746]
418 Collect SPObjVal = [5008.301587301594, 5614.054438167746, 5708.392810563295]
419 Collect_MPObjValNHua = [649.0, 656.1428571428569, 665.0]
420
421
422
      No, it is wrong, stop iteration
423
     Values adopted from the Itr-1' th iteration, and Itr = \{2\}, judgeCount = \{1\}
424
425
                \simjudgeCount = 1, SPObj SPF = 5614.054438167746
                                          gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                ai_SP-di: 9-20, taoi-deltai: 9-18, taoPi_SP-deltaPi_SP: 9-18, betaNi: 9,
426 Vessel i: 0:
                   pi: 0-5,
                            ai-di: 9-20,
     bi: 9
                   pi: 0-5,
427
     Vessel i: 1:
                             ai-di: 33-51,
                                            gi SP-gpi SP: 0.000000-0.000000,
                                                                                 ai SP-di: 33-51,
                                                                                                    taoi-deltai: 33-49,
                                                                                                                        taoPi SP-deltaPi SP: 33-49,
                                                                                                                                                       betaNi:
          bi: 16
     16.
428
     Vessel i: 2:
                   pi: 0-5,
                             ai-di: 57-67,
                                            gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                 ai_SP-di: 57-67,
                                                                                                    taoi-deltai: 57-65,
                                                                                                                        taoPi_SP-deltaPi_SP: 57-65,
                                                                                                                                                       betaNi:
     8, bi: 8
                   pi: 5-10,
     Vessel i: 3:
                              ai-di: 15-27,
                                              gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                  ai_SP-di: 15-27,
                                                                                                     taoi-deltai: 15-25,
                                                                                                                          taoPi SP-deltaPi SP: 15-25,
                                                                                                                                                        betaNi
           bi: 10
     : 10,
430 Vessel i: 4:
                   pi: 5-10,
                              ai-di: 42-62,
                                              gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                  ai_SP-di: 42-62,
                                                                                                     taoi-deltai: 42-60,
                                                                                                                          taoPi_SP-deltaPi_SP: 42-56,
                                                                                                                                                        betaNi
     : 18, bi: 18
                   pi: 12-18,
                                               gi_SP-gpi_SP: 0.000000-0.891036,
                                                                                                                           taoPi_SP-deltaPi_SP: 18-28,
     Vessel i: 5:
                                ai-di: 17-40,
                                                                                   ai_SP-di: 17-40,
                                                                                                      taoi-deltai: 18-28,
     betaNi: 10,
                   bi: 10
                   pi: 10-15,
                                ai-di: 21-48,
                                               gi_SP-gpi_SP: 1.000000-0.214615,
     Vessel i: 6:
                                                                                    ai_SP-di: 29-48,
                                                                                                      taoi-deltai: 29-42,
                                                                                                                           taoPi_SP-deltaPi_SP: 29-42,
     betaNi: 13,
                   bi: 13
433
                                ai-di: 37-57,
                                               gi_SP-gpi_SP: 0.400000-0.894350,
                                                                                   ai_SP-di: 41-57,
                                                                                                                           taoPi_SP-deltaPi_SP: 41-44,
     Vessel i: 7:
                   pi: 28-34,
                                                                                                      taoi-deltai: 40-44,
     betaNi: 4,
                  bi: 4
                  pi: 21-26,
                                                                                                                          taoPi_SP-deltaPi_SP: 13-29,
     Vessel i: 8:
                                ai-di: 8-41,
                                              gi_SP-gpi_SP: 0.600000-1.000000,
                                                                                   ai SP-di: 12-41,
                                                                                                     taoi-deltai: 12-29,
                                                                                                                                                        betaNi
     : 17, bi: 17
435
     Vessel i: 9:
                   pi: 16-21,
                                ai-di: 25-58,
                                              gi_SP-gpi_SP: 1.000000-0.000000,
                                                                                   ai_SP-di: 32-58,
                                                                                                      taoi-deltai: 32-54,
                                                                                                                           taoPi_SP-deltaPi_SP: 32-54,
     betaNi: 22,
                   bi: 22
436
437 round LB = [649, 5664, 6279]
438 round UB = [10666, 6270, 6270]
439
    round Hua = [0, 5008, 5614]
440 round SPObjVal = [5008, 5614, 5708]
441 round MPObjValNHua = [649, 656, 665]
442
443 OptimalObj = 6279.054438167746
444 Time: 168.000000
445
446
447
448 libpng warning: iCCP: known incorrect sRGB profile
449 libpng warning: iCCP: known incorrect sRGB profile
450
```