```
"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=39289

import sys; print('Python %s on %s' % (sys.version, sys.platform))
sys.path.extend(['E:\\1 □□□□\\3 □□□□□\\1 □□□□□□\\1 □□□□□□□□\\1_□□□□□□_□□□□\\1_LW _□□□□\\4 □□□□\\3 python_code\\9 Code for this paper', 'E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/3 python_code/9 Code for this paper'])

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
>>> runfile('E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/3 python_code/9 Code for this paper/main_RO_TWS.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/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
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]
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads

Optimize a model with 545514 rows, 52642 columns and 1523914 nonzeros
Model fingerprint: 0x36f8316c
Variable types: 1 continuous, 52641 integer (52605 binary)
Coefficient statistics:
  Matrix range     [1e+00, 1e+10]
  Objective range  [1e+00, 2e+01]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 2e+10]
Warning: Model contains large matrix coefficients
Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
Presolve removed 250782 rows and 16421 columns (presolve time = 5s) ...
Presolve removed 250782 rows and 16421 columns (presolve time = 10s) ...
Presolve removed 445934 rows and 32558 columns
Presolve time: 13.26s
Presolved: 99580 rows, 20084 columns, 308743 nonzeros
Variable types: 0 continuous, 20084 integer (20057 binary)

Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
Showing first log only...

Root relaxation presolved: 20084 rows, 119664 columns, 328827 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    7.1200000e+02   0.000000e+00   9.770000e+02     14s
Concurrent spin time: 0.00s

Solved with dual simplex (primal model)

Root relaxation: objective 7.120000e+02, 2890 iterations, 0.48 seconds (0.48 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

     0     0  712.00000    0    6          -  712.00000      -     -   14s
H    0     0                7012.0000000  712.00000  89.8%     -   15s
H    0     0                6572.0000000  712.00000  89.2%     -   15s
     0     0  712.00000    0  125 6572.00000  712.00000  89.2%     -   16s
     0     0  712.00000    0  112 6572.00000  712.00000  89.2%     -   16s
H    0     0                4992.0000000  712.00000  85.7%     -   16s
H    0     0                3392.0000000  712.00000  79.0%     -   16s
     0     0  712.00000    0  112 3392.00000  712.00000  79.0%     -   16s
     0     0  712.00000    0    6 3392.00000  712.00000  79.0%     -   17s
H    0     0                1132.0000000  712.00000  37.1%     -   17s
     0     0  712.00000    0   22 1132.00000  712.00000  37.1%     -   18s
     0     0  712.00000    0   10 1132.00000  712.00000  37.1%     -   23s
H    0     0                1012.0000000  712.00000  29.6%     -   24s
     0     0  712.00000    0   79 1012.00000  712.00000  29.6%     -   24s
H    0     0                 772.0000000  712.00000  7.77%     -   24s
     0     0  712.00000    0   80  772.00000  712.00000  7.77%     -   24s
     0     0  712.00000    0  183  772.00000  712.00000  7.77%     -   25s
     0     0  712.00000    0   26  772.00000  712.00000  7.77%     -   27s
H    0     0                 732.0000000  712.00000  2.73%     -   27s
H    0     0                 712.0000000  712.00000  0.00%     -   28s
     0     0  712.00000    0  250  712.00000  712.00000  0.00%     -   28s

Cutting planes:
  Gomory: 1
```

```
  Cover: 23
  Implied bound: 442
  Clique: 2
  MIR: 13
  StrongCG: 8
  Flow cover: 3
  GUB cover: 5
  RLT: 19
  Relax-and-lift: 2

Explored 1 nodes (25193 simplex iterations) in 28.16 seconds (46.88 work units)
Thread count was 8 (of 8 available processors)

Solution count 9: 712 732 772 ... 7012

Optimal solution found (tolerance 1.00e-10)
Best objective 7.120000000000e+02, best bound 7.120000000000e+02, gap 0.0000%
Set parameter MIPGap to value 1e-08
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]
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads

Optimize a model with 536247 rows, 14427 columns and 1098668 nonzeros
Model fingerprint: 0x126a090d
Variable types: 36 continuous, 14391 integer (8316 binary)
Coefficient statistics:
  Matrix range     [1e-01, 1e+10]
  Objective range  [6e-05, 5e+01]
  Bounds range     [1e+00, 1e+00]
  RHS range        [8e-01, 1e+10]
Warning: Model contains large matrix coefficients
Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
Presolve removed 533369 rows and 13482 columns
Presolve time: 0.39s
Presolved: 2878 rows, 945 columns, 7637 nonzeros
Variable types: 8 continuous, 937 integer (551 binary)
Found heuristic solution: objective 3593.0500186
Found heuristic solution: objective 3842.0500186

Root relaxation: objective 5.056670e+03, 876 iterations, 0.02 seconds (0.01 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

     0     0 5056.67026    0   88 3842.05002 5056.67026  31.6%     -    0s
H    0     0                3862.0500186 5056.67026  30.9%     -    0s
H    0     0                4926.6702574 5056.67026  2.64%     -    0s
H    0     0                4978.6702574 5056.67026  1.57%     -    0s
*    0     0               0    5056.6702574 5056.67026  0.00%     -    0s

Cutting planes:
  Learned: 23
  Gomory: 9
  Cover: 29
  Implied bound: 34
  Clique: 11
  MIR: 8
  StrongCG: 1
  Flow cover: 11
  GUB cover: 1
  Zero half: 12
  RLT: 13
  Relax-and-lift: 13
  PSD: 2

Explored 1 nodes (1799 simplex iterations) in 0.62 seconds (0.80 work units)
Thread count was 8 (of 8 available processors)

Solution count 6: 5056.67 4978.67 4926.67 ... 3593.05

Optimal solution found (tolerance 1.00e-08)
Best objective 5.056670257367e+03, best bound 5.056670257367e+03, gap 0.0000%
SP is solved
SP's optimal solution is'□5056

 Itr = 0
Collect_LB =   [712.0]
Collect_UB =   [10825.340514734511]
Collect_Hua =   [0.0]
Collect_SPObjVal =   [5056.6702573672555]
Collect_MPObjValNHua =   [712.0]
```

```
Set parameter MIPGap to value 1e-10
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]
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads

Optimize a model with 552257 rows, 283978 columns and 1530693 nonzeros
Model fingerprint: 0xd76ce765
Variable types: 1 continuous, 283977 integer (283941 binary)
Coefficient statistics:
  Matrix range     [1e+00, 1e+10]
  Objective range  [1e+00, 2e+01]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 2e+10]
Warning: Model contains large matrix coefficients
Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
Presolve removed 305127 rows and 255611 columns (presolve time = 5s) ...
Presolve removed 305127 rows and 255611 columns (presolve time = 10s) ...
Presolve removed 305127 rows and 255611 columns (presolve time = 15s) ...
Presolve removed 498316 rows and 271277 columns
Presolve time: 16.73s
Presolved: 53941 rows, 12701 columns, 182064 nonzeros
Variable types: 0 continuous, 12701 integer (12674 binary)

Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
Showing first log only...

Root relaxation presolved: 53921 rows, 12721 columns, 182004 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    5.7686703e+03   3.265000e+02   4.047642e+08     18s
Concurrent spin time: 0.14s

Solved with dual simplex (primal model)

Root relaxation: objective 5.768670e+03, 6266 iterations, 0.88 seconds (1.44 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

     0     0 5768.67026    0   29          - 5768.67026      -     -   19s
     0     0 5768.67026    0   72          - 5768.67026      -     -   20s
H    0     0                    7608.6702574 5768.67026  24.2%     -   21s
H    0     0                    7568.6702574 5768.67026  23.8%     -   21s
     0     0 5768.67026    0  188 7568.67026 5768.67026  23.8%     -   21s
     0     0 5768.67026    0  179 7568.67026 5768.67026  23.8%     -   21s
     0     0 5768.67026    0   83 7568.67026 5768.67026  23.8%     -   28s
     0     0 5768.67026    0  318 7568.67026 5768.67026  23.8%     -   30s
     0     0 5768.67026    0   81 7568.67026 5768.67026  23.8%     -   33s
H    0     0                    7388.6702574 5768.67026  21.9%     -   33s
     0     0 5768.67026    0  242 7388.67026 5768.67026  21.9%     -   34s
     0     0 5768.67026    0  162 7388.67026 5768.67026  21.9%     -   34s
H    0     0                    6808.6702574 5768.67026  15.3%     -   38s
     0     0 5768.67026    0   96 6808.67026 5768.67026  15.3%     -   39s
     0     0 5768.67026    0   93 6808.67026 5768.67026  15.3%     -   39s
     0     0 5768.67026    0  232 6808.67026 5768.67026  15.3%     -   40s
     0     0 5768.67026    0  226 6808.67026 5768.67026  15.3%     -   40s
     0     0 5768.67026    0  386 6808.67026 5768.67026  15.3%     -   41s
     0     0 5768.67026    0  364 6808.67026 5768.67026  15.3%     -   41s
     0     0 5768.67026    0  185 6808.67026 5768.67026  15.3%     -   45s
     0     0 5768.67026    0  151 6808.67026 5768.67026  15.3%     -   46s
H    0     0                    5768.6702574 5768.67026  0.00%     -   49s
     0     0 5768.67026    0  151 5768.67026 5768.67026  0.00%     -   49s

Cutting planes:
  Learned: 1
  Gomory: 2
  Cover: 62
  Implied bound: 37
  Clique: 735
  MIR: 46
  StrongCG: 34
  GUB cover: 15
  Zero half: 3
  RLT: 7
  Relax-and-lift: 28
  BQP: 24
```

```
248
249  Explored 1 nodes (125472 simplex iterations) in 49.44 seconds (71.19 work units)
250  Thread count was 8 (of 8 available processors)
251
252  Solution count 5: 5768.67 6808.67 7388.67 ... 7608.67
253
254  Optimal solution found (tolerance 1.00e-10)
255  Best objective 5.768670257367e+03, best bound 5.768670257367e+03, gap 0.0000%
256  Set parameter MIPGap to value 1e-08
257  Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
258
259  CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
260  Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
261
262  Optimize a model with 536247 rows, 14427 columns and 1098668 nonzeros
263  Model fingerprint: 0x756949ba
264  Variable types: 36 continuous, 14391 integer (8316 binary)
265  Coefficient statistics:
266    Matrix range     [1e-01, 1e+10]
267    Objective range  [6e-05, 5e+01]
268    Bounds range     [1e+00, 1e+00]
269    RHS range        [8e-01, 1e+10]
270  Warning: Model contains large matrix coefficients
271  Warning: Model contains large rhs
272           Consider reformulating model or setting NumericFocus parameter
273           to avoid numerical issues.
274  Presolve removed 531574 rows and 12874 columns
275  Presolve time: 0.36s
276  Presolved: 4673 rows, 1553 columns, 12409 nonzeros
277  Variable types: 8 continuous, 1545 integer (897 binary)
278  Found heuristic solution: objective 3675.0646186
279
280  Root relaxation: objective 5.320670e+03, 1641 iterations, 0.02 seconds (0.02 work units)
281
282      Nodes    |    Current Node    |     Objective Bounds      |     Work
283   Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
284
285       0     0 5320.67026    0    8 3675.06462 5320.67026  44.8%     -    0s
286  H    0     0                    5090.6702574 5320.67026  4.52%     -    0s
287  H    0     0                    5320.6702574 5320.67026  0.00%     -    0s
288       0     0 5320.67026    0    8 5320.67026 5320.67026  0.00%     -    0s
289
290  Explored 1 nodes (2190 simplex iterations) in 0.53 seconds (0.79 work units)
291  Thread count was 8 (of 8 available processors)
292
293  Solution count 3: 5320.67 5090.67 3675.06
294
295  Optimal solution found (tolerance 1.00e-08)
296  Best objective 5.320670257367e+03, best bound 5.320670257367e+03, gap 0.0000%
297  SP is solved
298  SP's optimal solution is'□5320
299
300   Itr = 1
301  Collect_LB =   [712.0, 5768.6702573672555]
302  Collect_UB =   [10825.340514734511, 6032.6702573672555]
303  Collect_Hua =   [0.0, 5056.6702573672555]
304  Collect_SPObjVal =   [5056.6702573672555, 5320.6702573672555]
305  Collect_MPObjValNHua =   [712.0, 712.0]
306
307
308  Set parameter MIPGap to value 1e-10
309  Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
310
311  CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
312  Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
313
314  Optimize a model with 552257 rows, 283978 columns and 1530693 nonzeros
315  Model fingerprint: 0x958e2f1f
316  Variable types: 1 continuous, 283977 integer (283941 binary)
317  Coefficient statistics:
318    Matrix range     [1e+00, 1e+10]
319    Objective range  [1e+00, 2e+01]
320    Bounds range     [1e+00, 1e+00]
321    RHS range        [1e+00, 2e+10]
322  Warning: Model contains large matrix coefficients
323  Warning: Model contains large rhs
324           Consider reformulating model or setting NumericFocus parameter
325           to avoid numerical issues.
326  Presolve removed 305576 rows and 255677 columns (presolve time = 5s) ...
327  Presolve removed 305576 rows and 255677 columns (presolve time = 10s) ...
328  Presolve removed 305576 rows and 255677 columns (presolve time = 15s) ...
329  Presolve removed 498934 rows and 271325 columns
330  Presolve time: 16.38s
331  Presolved: 53323 rows, 12653 columns, 181012 nonzeros
```

```
Variable types: 0 continuous, 12653 integer (12626 binary)

Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
Showing first log only...

Root relaxation presolved: 53304 rows, 12672 columns, 180955 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    6.0326703e+03   3.243750e+02   4.038423e+08     17s
Concurrent spin time: 0.09s

Solved with dual simplex (primal model)

Root relaxation: objective 6.032670e+03, 5729 iterations, 0.70 seconds (1.21 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

     0     0 6032.67026    0   39          - 6032.67026      -     -   18s
     0     0 6032.67026    0  167          - 6032.67026      -     -   21s
     0     0 6032.67026    0   76          - 6032.67026      -     -   21s
     0     0 6032.67026    0  198          - 6032.67026      -     -   22s
     0     0 6032.67026    0  152          - 6032.67026      -     -   22s
     0     0 6032.67026    0  100          - 6032.67026      -     -   27s
     0     0 6032.67026    0   87          - 6032.67026      -     -   28s
     0     0 6032.67026    0  167          - 6032.67026      -     -   28s
     0     0 6032.67026    0  104          - 6032.67026      -     -   30s
     0     0 6032.67026    0  229          - 6032.67026      -     -   31s
     0     0 6032.67026    0  131          - 6032.67026      -     -   34s
H    0     0                 9812.6702574 6032.67026  38.5%     -   34s
     0     0 6032.67026    0  131 9812.67026 6032.67026  38.5%     -   35s
H    0     0                 7672.6702574 6032.67026  21.4%     -   36s
H    0     0                 6032.6702574 6032.67026  0.00%     -   38s
     0     0 6032.67026    0  131 6032.67026 6032.67026  0.00%     -   38s

Cutting planes:
  Learned: 4
  Cover: 297
  Implied bound: 31
  Clique: 2223
  MIR: 176
  StrongCG: 146
  GUB cover: 34
  RLT: 10
  Relax-and-lift: 75
  BQP: 26

Explored 1 nodes (70091 simplex iterations) in 38.33 seconds (57.06 work units)
Thread count was 8 (of 8 available processors)

Solution count 3: 6032.67 7672.67 9812.67

Optimal solution found (tolerance 1.00e-10)
Best objective 6.032670257367e+03, best bound 6.032670257367e+03, gap 0.0000%
Set parameter MIPGap to value 1e-08
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]
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads

Optimize a model with 536247 rows, 14427 columns and 1098668 nonzeros
Model fingerprint: 0x2384fc6a
Variable types: 36 continuous, 14391 integer (8316 binary)
Coefficient statistics:
  Matrix range     [1e-01, 1e+10]
  Objective range  [6e-05, 5e+01]
  Bounds range     [1e+00, 1e+00]
  RHS range        [8e-01, 1e+10]
Warning: Model contains large matrix coefficients
Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
Presolve removed 531434 rows and 12838 columns
Presolve time: 0.35s
Presolved: 4813 rows, 1589 columns, 12782 nonzeros
Variable types: 8 continuous, 1581 integer (915 binary)
Found heuristic solution: objective 3687.8601380

Root relaxation: objective 5.332860e+03, 1343 iterations, 0.02 seconds (0.01 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
```

```
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

H    0     0                    5332.8601380 14291.7410   168%     -    0s
     0     0        -    0      5332.86014 5332.86014  0.00%     -    0s

Explored 1 nodes (1787 simplex iterations) in 0.52 seconds (0.77 work units)
Thread count was 8 (of 8 available processors)

Solution count 2: 5332.86 3687.86

Optimal solution found (tolerance 1.00e-08)
Best objective 5.332860137998e+03, best bound 5.332860137998e+03, gap 0.0000%
SP is solved
SP's optimal solution is'□5332

 Itr = 2
Collect_LB =   [712.0, 5768.6702573672555, 6032.6702573672555]
Collect_UB =   [10825.340514734511, 6032.6702573672555, 6032.6702573672555]
Collect_Hua =   [0.0, 5056.6702573672555, 5320.6702573672555]
Collect_SPObjVal =   [5056.6702573672555, 5320.6702573672555, 5332.8601379975335]
Collect_MPObjValNHua =   [712.0, 712.0, 712.0]


  Reach the termination conditions, stop iteration
  Values adopted from the Itr-1' th iteration, and Itr = {2}, judgeCount = {1}

~~~~~~~~~~judgeCount = 1, SPObj_SPF = 5320.6702573672555
Vessel i: 0:      pi: 0-5,      ai-di: 38-81,      gi_SP-gpi_SP: 0.000000-0.000000,      ai_SP-di: 38-81,      taoi-deltai: 38-50,      taoPi_SP-deltaPi_SP: 38-50,      betaNi: 12,      bi: 12
Vessel i: 1:      pi: 0-5,      ai-di: 8-18,      gi_SP-gpi_SP: 0.000000-0.000000,      ai_SP-di: 8-18,      taoi-deltai: 8-13,      taoPi_SP-deltaPi_SP: 11-13,      betaNi: 5,      bi: 5
Vessel i: 2:      pi: 5-11,      ai-di: 32-67,      gi_SP-gpi_SP: 0.000000-0.000000,      ai_SP-di: 32-67,      taoi-deltai: 32-53,      taoPi_SP-deltaPi_SP: 32-53,      betaNi: 21,      bi: 21
Vessel i: 3:      pi: 6-11,      ai-di: 12-38,      gi_SP-gpi_SP: 0.000000-0.000000,      ai_SP-di: 12-38,      taoi-deltai: 12-25,      taoPi_SP-deltaPi_SP: 12-25,      betaNi: 13,      bi: 13
Vessel i: 4:      pi: 11-16,      ai-di: 43-81,      gi_SP-gpi_SP: 0.000000-0.000000,      ai_SP-di: 43-81,      taoi-deltai: 43-54,      taoPi_SP-deltaPi_SP: 43-54,      betaNi: 11,      bi: 11
Vessel i: 5:      pi: 21-26,      ai-di: 11-45,      gi_SP-gpi_SP: 0.000000-0.800000,      ai_SP-di: 11-45,      taoi-deltai: 12-27,      taoPi_SP-deltaPi_SP: 12-27,      betaNi: 15,      bi: 15
Vessel i: 6:      pi: 11-18,      ai-di: 3-60,      gi_SP-gpi_SP: 1.000000-0.000000,      ai_SP-di: 11-60,      taoi-deltai: 11-39,      taoPi_SP-deltaPi_SP: 11-39,      betaNi: 28,      bi: 28
Vessel i: 7:      pi: 18-23,      ai-di: 31-79,      gi_SP-gpi_SP: 0.400000-1.000000,      ai_SP-di: 35-79,      taoi-deltai: 33-37,      taoPi_SP-deltaPi_SP: 35-37,      betaNi: 4,      bi: 4
Vessel i: 8:      pi: 28-34,      ai-di: 19-68,      gi_SP-gpi_SP: 1.000000-0.600000,      ai_SP-di: 26-68,      taoi-deltai: 26-41,      taoPi_SP-deltaPi_SP: 26-41,      betaNi: 15,      bi: 15

round LB =   [712, 5769, 6033]
round UB =   [10825, 6033, 6033]
round Hua =   [0, 5057, 5321]
round SPObjVal =   [5057, 5321, 5333]
round MPObjValNHua =   [712, 712, 712]

OptimalObj = 6032.6702573672555
Time: 184.000000
```