```
"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=6572

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_DeterministicModel.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.....
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 610018 rows, 47910 columns and 1797453 nonzeros
Model fingerprint: 0x01c9ffd6
Variable types: 0 continuous, 47910 integer (40308 binary)
Coefficient statistics:
  Matrix range     [1e-01, 1e+15]
  Objective range  [1e+00, 5e+01]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 2e+15]
Warning: Model contains large matrix coefficient range
Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
Presolve removed 451445 rows and 27103 columns (presolve time = 5s) ...
Presolve removed 538522 rows and 34394 columns
Presolve time: 8.58s
Presolved: 71496 rows, 13516 columns, 264128 nonzeros
Variable types: 0 continuous, 13516 integer (13256 binary)

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

Root relaxation presolved: 13512 rows, 85000 columns, 277285 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0   -7.1820000e+03   0.000000e+00   8.674058e+04      9s
    5940    1.2559502e+03   0.000000e+00   1.153515e+04     10s
Concurrent spin time: 0.35s

Solved with dual simplex (primal model)

Root relaxation: objective 1.245983e+03, 3957 iterations, 1.34 seconds (1.53 work units)

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

     0     0 1245.98286    0 1120          - 1245.98286      -     -   12s
     0     0 1262.57976    0 1557          - 1262.57976      -     -   16s
     0     0 1269.23479    0 1451          - 1269.23479      -     -   17s
     0     0 1269.23479    0 1456          - 1269.23479      -     -   17s
     0     0 1271.39415    0 1540          - 1271.39415      -     -   18s
     0     0 1271.75992    0 1498          - 1271.75992      -     -   19s
     0     0 1272.17842    0 1487          - 1272.17842      -     -   19s
     0     0 1272.31178    0 1522          - 1272.31178      -     -   19s
     0     0 1272.37303    0 1503          - 1272.37303      -     -   20s
     0     0 1272.44301    0 1488          - 1272.44301      -     -   20s
     0     0 1272.50033    0 1480          - 1272.50033      -     -   20s
     0     0 1272.57856    0 1409          - 1272.57856      -     -   21s
     0     0 1272.81930    0 1489          - 1272.81930      -     -   21s
     0     0 1272.88940    0 1490          - 1272.88940      -     -   21s
     0     0 1273.08516    0 2050          - 1273.08516      -     -   21s
     0     0 1280.81410    0 1973          - 1280.81410      -     -   22s
     0     0 1280.81410    0 2074          - 1280.81410      -     -   22s
     0     0 1280.81410    0 2077          - 1280.81410      -     -   22s
     0     0 1280.81410    0 1997          - 1280.81410      -     -   22s
     0     0 1280.81410    0 2190          - 1280.81410      -     -   23s
     0     0 1280.81410    0 2489          - 1280.81410      -     -   23s
     0     0 1280.81410    0 2403          - 1280.81410      -     -   23s
     0     0 1280.81410    0 2321          - 1280.81410      -     -   23s
     0     0 1280.81410    0 2324          - 1280.81410      -     -   23s
     0     0 1280.81410    0 2314          - 1280.81410      -     -   23s
```

80		0	0	1280.81410	0	2322	-	1280.81410	-	-	24s
81		0	0	1280.81410	0	2337	-	1280.81410	-	-	24s
82		0	0	1280.81410	0	2355	-	1280.81410	-	-	24s
83		0	0	1280.81410	0	2361	-	1280.81410	-	-	24s
84		0	0	1280.81410	0	2370	-	1280.81410	-	-	24s
85		0	0	1280.81410	0	2375	-	1280.81410	-	-	24s
86		0	0	1280.81410	0	2380	-	1280.81410	-	-	24s
87		0	0	1280.81410	0	2384	-	1280.81410	-	-	24s
88		0	0	1280.81410	0	2389	-	1280.81410	-	-	24s
89		0	0	1280.81410	0	2386	-	1280.81410	-	-	24s
90		0	0	1280.84816	0	2388	-	1280.84816	-	-	24s
91		0	0	1280.84816	0	2388	-	1280.84816	-	-	25s
92		0	0	1280.84816	0	2384	-	1280.84816	-	-	25s
93		0	0	1280.84816	0	2364	-	1280.84816	-	-	25s
94		0	0	1280.84816	0	2352	-	1280.84816	-	-	25s
95		0	0	1280.84816	0	2300	-	1280.84816	-	-	25s
96		0	0	1280.84816	0	2299	-	1280.84816	-	-	25s
97		0	0	1280.84816	0	2299	-	1280.84816	-	-	25s
98		0	0	1280.84816	0	2312	-	1280.84816	-	-	25s
99		0	0	1280.84816	0	2315	-	1280.84816	-	-	25s
100		0	0	1280.84816	0	2289	-	1280.84816	-	-	26s
101		0	0	1280.84816	0	2258	-	1280.84816	-	-	26s
102		0	0	1280.84816	0	2270	-	1280.84816	-	-	26s
103		0	0	1280.84816	0	2122	-	1280.84816	-	-	26s
104		0	0	1280.84816	0	2127	-	1280.84816	-	-	26s
105		0	0	1280.84816	0	2252	-	1280.84816	-	-	26s
106		0	0	1280.84816	0	2264	-	1280.84816	-	-	26s
107		0	0	1288.74599	0	2074	-	1288.74599	-	-	30s
108		0	0	1299.17945	0	1257	-	1299.17945	-	-	33s
109		0	0	1299.17945	0	1246	-	1299.17945	-	-	33s
110	H	0	0		2563.0000000		1300.55581	49.3%	-	34s	
111		0	0	1300.55581	0	1106	2563.00000	1300.55581	49.3%	-	34s
112		0	0	1301.08830	0	1079	2563.00000	1301.08830	49.2%	-	35s
113		0	0	1301.08830	0	1116	2563.00000	1301.08830	49.2%	-	35s
114		0	0	1301.29963	0	2278	2563.00000	1301.29963	49.2%	-	36s
115		0	0	1302.43747	0	2243	2563.00000	1302.43747	49.2%	-	36s
116		0	0	1303.41230	0	2338	2563.00000	1303.41230	49.1%	-	37s
117		0	0	1303.72786	0	2336	2563.00000	1303.72786	49.1%	-	37s
118		0	0	1304.42833	0	2342	2563.00000	1304.42833	49.1%	-	38s
119		0	0	1304.55307	0	2352	2563.00000	1304.55307	49.1%	-	38s
120		0	0	1304.76035	0	2364	2563.00000	1304.76035	49.1%	-	39s
121		0	0	1304.91789	0	2368	2563.00000	1304.91789	49.1%	-	39s
122		0	0	1305.09378	0	2380	2563.00000	1305.09378	49.1%	-	39s
123		0	0	1305.73092	0	2379	2563.00000	1305.73092	49.1%	-	39s
124		0	0	1305.80958	0	2384	2563.00000	1305.80958	49.1%	-	40s
125		0	0	1305.95577	0	2383	2563.00000	1305.95577	49.0%	-	40s
126	H	0	0		2518.0000000		1306.53533	48.1%	-	40s	
127		0	0	1306.53533	0	2500	2518.00000	1306.53533	48.1%	-	40s
128		0	0	1306.65679	0	2396	2518.00000	1306.65679	48.1%	-	40s
129		0	0	1307.16132	0	2453	2518.00000	1307.16132	48.1%	-	41s
130		0	0	1307.24826	0	2462	2518.00000	1307.24826	48.1%	-	42s
131		0	0	1307.73511	0	2481	2518.00000	1307.73511	48.1%	-	42s
132		0	0	1307.82175	0	2485	2518.00000	1307.82175	48.1%	-	42s
133		0	0	1308.29432	0	2492	2518.00000	1308.29432	48.0%	-	43s
134		0	0	1308.43105	0	2439	2518.00000	1308.43105	48.0%	-	43s
135		0	0	1308.52258	0	2416	2518.00000	1308.52258	48.0%	-	43s
136		0	0	1308.68093	0	2417	2518.00000	1308.68093	48.0%	-	44s
137		0	0	1309.14934	0	2451	2518.00000	1309.14934	48.0%	-	45s
138		0	0	1309.23486	0	2461	2518.00000	1309.23486	48.0%	-	45s
139		0	0	1309.62813	0	2470	2518.00000	1309.62813	48.0%	-	45s
140		0	0	1309.70695	0	2482	2518.00000	1309.70695	48.0%	-	45s
141		0	0	1310.07116	0	2444	2518.00000	1310.07116	48.0%	-	46s
142		0	0	1310.08654	0	2467	2518.00000	1310.08654	48.0%	-	46s
143		0	0	1310.16137	0	2470	2518.00000	1310.16137	48.0%	-	46s
144		0	0	1310.29352	0	2460	2518.00000	1310.29352	48.0%	-	47s
145		0	0	1310.68789	0	2443	2518.00000	1310.68789	47.9%	-	47s
146		0	0	1310.75771	0	2470	2518.00000	1310.75771	47.9%	-	48s
147		0	0	1310.87126	0	2476	2518.00000	1310.87126	47.9%	-	48s
148		0	0	1311.18922	0	2386	2518.00000	1311.18922	47.9%	-	48s
149		0	0	1311.26411	0	2378	2518.00000	1311.26411	47.9%	-	48s
150		0	0	1311.40209	0	2315	2518.00000	1311.40209	47.9%	-	49s
151		0	0	1311.59496	0	2323	2518.00000	1311.59496	47.9%	-	49s
152		0	0	1311.67408	0	2284	2518.00000	1311.67408	47.9%	-	49s
153		0	0	1311.76253	0	2300	2518.00000	1311.76253	47.9%	-	49s
154		0	0	1311.87763	0	2306	2518.00000	1311.87763	47.9%	-	49s
155		0	0	1311.93342	0	2317	2518.00000	1311.93342	47.9%	-	49s
156		0	0	1312.01986	0	2321	2518.00000	1312.01986	47.9%	-	50s
157		0	0	1312.15108	0	2315	2518.00000	1312.15108	47.9%	-	50s
158		0	0	1312.16691	0	2318	2518.00000	1312.16691	47.9%	-	50s
159		0	0	1312.22302	0	2317	2518.00000	1312.22302	47.9%	-	50s
160		0	0	1312.29515	0	2184	2518.00000	1312.29515	47.9%	-	50s
161		0	0	1312.43775	0	2248	2518.00000	1312.43775	47.9%	-	50s
162		0	0	1312.49498	0	2233	2518.00000	1312.49498	47.9%	-	51s
163		0	0	1312.52987	0	2217	2518.00000	1312.52987	47.9%	-	51s

```
164      0    0 1312.60069    0 2227 2518.00000 1312.60069  47.9%    -   51s
165      0    0 1312.67716    0 2234 2518.00000 1312.67716  47.9%    -   51s
166      0    0 1312.70182    0 2206 2518.00000 1312.70182  47.9%    -   51s
167      0    0 1312.73133    0 2209 2518.00000 1312.73133  47.9%    -   51s
168      0    0 1312.78340    0 2202 2518.00000 1312.78340  47.9%    -   52s
169      0    0 1312.78464    0 2239 2518.00000 1312.78464  47.9%    -   52s
170      0    0 1324.85592    0 1689 2518.00000 1324.85592  47.4%    -   54s
171      0    0 1324.85592    0 1707 2518.00000 1324.85592  47.4%    -   54s
172      0    0 1330.46435    0 1958 2518.00000 1330.46435  47.2%    -   55s
173      0    0 1330.46435    0 1957 2518.00000 1330.46435  47.2%    -   55s
174      0    0 1331.86801    0 1568 2518.00000 1331.86801  47.1%    -   56s
175      0    0 1332.02865    0 1610 2518.00000 1332.02865  47.1%    -   56s
176      0    0 1332.45674    0 1633 2518.00000 1332.45674  47.1%    -   56s
177      0    0 1332.52406    0 1659 2518.00000 1332.52406  47.1%    -   56s
178      0    0 1332.52406    0 1622 2518.00000 1332.52406  47.1%    -   57s
179      0    0 1335.67233    0 1465 2518.00000 1335.67233  47.0%    -   58s
180      0    0 1336.87463    0 1409 2518.00000 1336.87463  46.9%    -   59s
181      0    0 1336.87463    0 1394 2518.00000 1336.87463  46.9%    -   59s
182      0    0 1337.17752    0 1430 2518.00000 1337.17752  46.9%    -   59s
183      0    0 1337.52228    0 1409 2518.00000 1337.52228  46.9%    -   60s
184      0    0 1337.66997    0 1358 2518.00000 1337.66997  46.9%    -   60s
185      0    0 1337.84832    0 1431 2518.00000 1337.84832  46.9%    -   60s
186      0    0 1338.00991    0 1456 2518.00000 1338.00991  46.9%    -   60s
187      0    0 1338.18569    0 1487 2518.00000 1338.18569  46.9%    -   61s
188      0    0 1338.35484    0 1488 2518.00000 1338.35484  46.8%    -   61s
189      0    0 1338.53015    0 1433 2518.00000 1338.53015  46.8%    -   61s
190      0    0 1338.53015    0 1434 2518.00000 1338.53015  46.8%    -   61s
191      0    0 1339.61392    0  363 2518.00000 1339.61392  46.8%    -   63s
192      0    0 1339.61392    0  362 2518.00000 1339.61392  46.8%    -   63s
193  H   0    0                    1938.0000000 1339.61392  30.9%    -   64s
194      0    0 1339.61392    0  333 1938.00000 1339.61392  30.9%    -   64s
195      0    0 1339.97018    0  251 1938.00000 1339.97018  30.9%    -   69s
196      0    0 1339.97018    0  192 1938.00000 1339.97018  30.9%    -   72s
197      0    0 1340.11944    0  383 1938.00000 1340.11944  30.9%    -   75s
198      0    0 1340.13577    0  338 1938.00000 1340.13577  30.8%    -   77s
199      0    0 1340.35201    0  423 1938.00000 1340.35201  30.8%    -   80s
200      0    0 1340.35201    0  390 1938.00000 1340.35201  30.8%    -   82s
201      0    0 1340.35201    0  560 1938.00000 1340.35201  30.8%    -   84s
202      0    0 1340.35201    0  559 1938.00000 1340.35201  30.8%    -   84s
203      0    0 1340.35201    0  402 1938.00000 1340.35201  30.8%    -   85s
204      0    0 1340.35201    0  222 1938.00000 1340.35201  30.8%    -   88s
205      0    0 1340.35201    0  224 1938.00000 1340.35201  30.8%    -   89s
206      0    0 1340.35201    0  233 1938.00000 1340.35201  30.8%    -   92s
207      0    0 1340.35201    0  233 1938.00000 1340.35201  30.8%    -   93s
208      0    2 1340.35201    0  233 1938.00000 1340.35201  30.8%    -   96s
209     11   16 1357.71578    4  146 1938.00000 1347.00013  30.5%  880  101s
210     36   40 1357.71578    8  159 1938.00000 1347.71578  30.5%  543  105s
211     70   73 1358.17991   12  182 1938.00000 1347.71578  30.5%  441  110s
212    111  104 1362.25652   20  173 1938.00000 1347.71578  30.5%  340  116s
213    133  121 1364.38245   24  163 1938.00000 1347.71578  30.5%  314  120s
214    162  164 1365.86393   28  182 1938.00000 1347.71578  30.5%  283  125s
215  H 169  164                  1438.0000000 1347.71578  6.28%  273  125s
216  H 205  177                  1418.0000000 1347.71578  4.96%  241  128s
217  H 218  182                  1378.0000000 1347.71578  2.20%  233  130s
218    285  222 1360.90700   15  161 1378.00000 1347.71578  2.20%  228  135s
219    326  227     cutoff   25      1378.00000 1347.71578  2.20%  222  141s
220    364  235 1363.12922   32  246 1378.00000 1347.71578  2.20%  222  146s
221    460  221 infeasible   57      1378.00000 1347.71578  2.20%  214  155s
222    490  231 1352.57367   16  160 1378.00000 1347.71578  2.20%  227  161s
223    577  289 1368.00000   43  158 1378.00000 1347.71578  2.20%  220  166s
224    663  319 1347.71578   11  304 1378.00000 1347.71578  2.20%  212  170s
225    725  332 1374.24033   19  131 1378.00000 1347.94689  2.18%  218  176s
226    773  346 1361.33333   13  245 1378.00000 1349.10431  2.10%  225  181s
227  H 796  222                  1358.0000000 1349.10431  0.66%  226  181s
228    830  196 1354.57367   21  229 1358.00000 1350.90700  0.52%  237  188s
229    879  196 1351.04911   16  291 1358.00000 1350.90700  0.52%  245  191s
230    957  186 1351.04911   22  271 1358.00000 1351.04911  0.51%  259  196s
231   1064  153     cutoff   17      1358.00000 1351.07062  0.51%  277  202s
232   1098  144 1355.29154   20  223 1358.00000 1352.38245  0.41%  289  206s
233   1226    0 1354.38245   37  250 1358.00000 1354.38245  0.27%  289  211s
234
235  Cutting planes:
236    Learned: 743
237    Gomory: 25
238    Cover: 820
239    Implied bound: 82
240    Clique: 50
241    MIR: 279
242    StrongCG: 111
243    Flow cover: 6
244    GUB cover: 215
245    Inf proof: 3
246    Zero half: 121
247    RLT: 203
```

```
  Relax-and-lift: 1481
  BQP: 13

Explored 1332 nodes (430488 simplex iterations) in 211.60 seconds (254.13 work units)
Thread count was 8 (of 8 available processors)

Solution count 7: 1358 1378 1418 ... 2563

Optimal solution found (tolerance 1.00e-04)
Best objective 1.358000000000e+03, best bound 1.358000000000e+03, gap 0.0000%
Optimal Obj:  1358.0
Obj = 1358.0
Solutions
Vessel i: 0:  li: 5,  pi: 9-14,  ai-di: 1-37,  taoi-deltai: 1-34,  periodi: 33,  taoPi_SP-deltaPi_SP: 1-18,  periodPi: 17,  betaNi: 21,  bi: 33,  Txijt: 165,  o1i: 165,  o2i: 340,  o3i: -400,  o4i: 420,  Ti: 525
Vessel i: 1:  li: 6,  pi: 28-34,  ai-di: 10-30,  taoi-deltai: 10-32,  periodi: 22,  taoPi_SP-deltaPi_SP: 10-18,  periodPi: 8,  betaNi: 12,  bi: 22,  Txijt: 132,  o1i: 172,  o2i: 160,  o3i: -364,  o4i: 240,  Ti: 208
Vessel i: 2:  li: 5,  pi: 19-24,  ai-di: 11-24,  taoi-deltai: 11-27,  periodi: 16,  taoPi_SP-deltaPi_SP: 11-15,  periodPi: 4,  betaNi: 12,  bi: 16,  Txijt: 80,  o1i: 140,  o2i: 80,  o3i: -300,  o4i: 240,  Ti: 160
Vessel i: 3:  li: 5,  pi: 14-19,  ai-di: 13-26,  taoi-deltai: 14-23,  periodi: 9,  taoPi_SP-deltaPi_SP: 14-19,  periodPi: 5,  betaNi: 6,  bi: 9,  Txijt: 45,  o1i: 65,  o2i: 100,  o3i: -100,  o4i: 120,  Ti: 185
Vessel i: 4:  li: 5,  pi: 13-18,  ai-di: 38-63,  taoi-deltai: 38-60,  periodi: 22,  taoPi_SP-deltaPi_SP: 38-46,  periodPi: 8,  betaNi: 12,  bi: 22,  Txijt: 110,  o1i: 110,  o2i: 160,  o3i: -350,  o4i: 240,  Ti: 160
Vessel i: 5:  li: 5,  pi: 8-13,  ai-di: 40-50,  taoi-deltai: 40-50,  periodi: 10,  taoPi_SP-deltaPi_SP: 40-44,  periodPi: 4,  betaNi: 7,  bi: 10,  Txijt: 50,  o1i: 50,  o2i: 80,  o3i: -150,  o4i: 140,  Ti: 120
TimeSolveModel: 231.000000



TimeAll: 234.000000
```