```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=38840
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   01 My Python Code', 'E:/1 0000/3 00000/1 000000/1 0000000/1 000000 0000/1 LW 00002/6 0000/2 python code/
   01_My_Python_Code'])
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
  python code/01_My_Python_Code')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
   Waiting 1s....
12
13
  This is the R_12_7 standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
   Start
16
17
   Before iteration:
     Read basic data
18
19
     Parameter setting:
20
       trail = 58
21
       Pop_size = 30
       Tolerance iteration unchanged number = 10
23
       Chrom size = 36
       Iter_num_GA = 300
24
25
       Select_rate = 0.85
26
       Crossover rate = 0.95
27
       Mutation rate = 0.95
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 2
30
       coefficient for Obj1= 1.9
       coefficient for Obj2= 0.100000000000000009
31
32
33
34
   Iteration begin:
35
   Beging the No. 0 iteration:
     obj[0] = 37.70 temp_best_value_gen = 37.70
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 37.70 temp_best_value_gen = 37.70
40
     No, maintain solution and obj[gen] = 37.70, and the tolerance_counter = 1
41
42
     solution chromosome =
       first level: [ [ 1.5 4.5 7.5 11. 14.5 19.5 26. 4.5 1.5 1.5 4.5 4.5 ]
43
       second level: [2, 4, 5, 0, 4, 0, 3, 7, 9, 11, 13, 0,]
44
       third level: [2. 3. 3. 3. 2. 2. 5. 3. 2. 3. 4. 8.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
obj[gen-1] = 37.70 temp_best_value_gen = 37.70
49
50
     No, maintain solution and obj[gen] = 37.70, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [ 1.5 4.5 7.5 11. 14.5 19.5 26. 4.5 1.5 1.5 4.5 4.5 ]
53
       second level: [ 2. 4. 5. 0. 4. 0. 3. 7. 9. 11. 13. 0.]
54
       third level: [2. 3. 3. 3. 2. 2. 5. 3. 2. 3. 4. 8.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 37.70 temp best value gen = 37.70
59
     No, maintain solution and obj[gen] = 37.70, and the tolerance_counter = 3
60
     solution chromosome =
       first level: [[ 1.5 4.5 7.5 11. 14.5 19.5 26. 4.5 1.5 1.5 4.5 4.5]
61
62
       second level: [ 2. 4. 5. 0. 4. 0. 3. 7. 9. 11. 13. 0.]
       third level: [2. 3. 3. 3. 2. 2. 5. 3. 2. 3. 4. 8.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 37.70 temp_best_value_gen = 37.70
68
     No, maintain solution and obj[gen] = 37.70, and the tolerance_counter = 4
69
     solution chromosome =
       first level: [ [ 1.5 4.5 7.5 11. 14.5 19.5 26. 4.5 1.5 1.5 4.5 4.5 ]
70
71
       second level: [ 2. 4. 5. 0. 4. 0. 3. 7. 9. 11. 13. 0.]
       third level: [2. 3. 3. 3. 2. 2. 5. 3. 2. 3. 4. 8.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 37.70 temp best value gen = 37.70
76
77
     No, maintain solution and obj[gen] = 37.70, and the tolerance_counter = 5
78
     solution chromosome =
        first level: [ [ 1.5 4.5 7.5 11. 14.5 19.5 26. 4.5 1.5 1.5 4.5 4.5 ]
```

```
second level: [ 2. 4. 5. 0. 4. 0. 3. 7. 9. 11. 13. 0.]
 80
 81
          third level: [2. 3. 3. 3. 2. 2. 5. 3. 2. 3. 4. 8.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
        obj[gen-1] = 37.70 temp best value gen = 37.70
        No, maintain solution and obj[gen] = 37.70, and the tolerance_counter = 6
 86
 87
        solution chromosome =
          first level: [ [ 1.5 4.5 7.5 11. 14.5 19.5 26. 4.5 1.5 1.5 4.5 4.5 ]
 88
          second level: [2. 4. 5. 0. 4. 0. 3. 7. 9. 11. 13. 0.]
 89
 90
          third level: [2. 3. 3. 3. 2. 2. 5. 3. 2. 3. 4. 8.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 37.70 temp_best_value_gen = 37.70
 95
        No, maintain solution and obj[gen] = 37.70, and the tolerance_counter = 7
 96
        solution chromosome =
 97
          first level: [ [ 1.5 4.5 7.5 11. 14.5 19.5 26. 4.5 1.5 1.5 4.5 4.5 ]
 98
          second level: [ 2. 4. 5. 0. 4. 0. 3. 7. 9. 11. 13. 0.]
 99
          third level: [2. 3. 3. 3. 2. 2. 5. 3. 2. 3. 4. 8.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
103
        obi[gen-1] = 37.70 temp best value gen = 37.70
        No, maintain solution and obj[gen] = 37.70, and the tolerance_counter = 8
104
105
        solution chromosome =
          first level: [ [ 1.5 4.5 7.5 11. 14.5 19.5 26. 4.5 1.5 1.5 4.5 4.5 ]
106
107
          second level: [ 2. 4. 5. 0. 4. 0. 3. 7. 9. 11. 13. 0.]
          third level: [2. 3. 3. 3. 2. 2. 5. 3. 2. 3. 4. 8.]]
108
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 37.70 temp_best_value_gen = 37.70
        No, maintain solution and obj[gen] = 37.70, and the tolerance_counter = 9
113
114
        solution chromosome =
115
          first level: [ [ 1.5 4.5 7.5 11. 14.5 19.5 26. 4.5 1.5 1.5 4.5 4.5 ]
116
           second level: [ 2. 4. 5. 0. 4. 0. 3. 7. 9. 11. 13. 0.]
          third level: [2. 3. 3. 3. 2. 2. 5. 3. 2. 3. 4. 8.]]
117
118
        The No. 9 iteration is finished!
119
120
121
     The iteration is terminated and then visulize the solution:
122
123
        solution chromosome
          first level: [ [ 1.5 4.5 7.5 11. 14.5 19.5 26. 4.5 1.5 1.5 4.5 4.5 ]
124
125
          second level: [ 2. 4. 5. 0. 4. 0. 3. 7. 9. 11. 13. 0.]
          third level: [2. 3. 3. 3. 2. 2. 5. 3. 2. 3. 4. 8.]]
126
127
        Objective function values and some other indicators:
                                Obj1 = 111.00
128
          Obi0 = 14.00
                                                          Obj0 + Obj1 = 125.00
129
          Total movement of crane: 40.00
130
          Total waiting time in berth position: 58.00
          Total index of q during berthing: 494.00
131
        Specific arrangement for each vessel:
132
                                                                                                                            gama i0: 2.0
133
           V_id: 0
                              1i: 3.0
                                                   xi: 1.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 3.0
                                                                                                                                                        gama_i1: 6.0
                     duration_time_i: 4.0
                                                        demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
134
           V id: 1
                              li: 3.0
                                                   xi: 4.5
                                                                       bow of i: 3.0
                                                                                                   tail of i: 6.0
                                                                                                                            gama i0: 4.0
                                                                                                                                                        gama i1: 7.0
                     duration time i: 3.0
                                                        demand\_i{:}\ 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap i: 0
135
           V_id: 2
                              1i: 3.0
                                                   xi: 7.5
                                                                       bow of i: 6.0
                                                                                                   tail of i: 9.0
                                                                                                                            gama_i0: 5.0
                                                                                                                                                        gama_i1: 7.0
                     duration_time_i: 2.0
                                                        demand_i: 120.0
                                                                                      work load_i: 120.0
                                                                                                                       work load gap_i: 0
136
           V_id: 3
                              1i: 4.0
                                                                         bow of i: 9.0
                                                                                                     tail of i: 13.0
                                                                                                                                 gama i0: 0.0
                                                                                                                                                             gama_i1: 3
                                                   xi: 11.0
                                                                                         work load_i: 140.0
                                                                                                                         work load gap_i: 0
     .0
                       duration_time_i: 3.0
                                                          demand i: 140.0
                                                                                                                                 gama_i0: 4.0
137
           V id: 4
                              li: 3.0
                                                   xi: 14.5
                                                                         bow of i: 13.0
                                                                                                     tail of i: 16.0
                                                                                                                                                             gama i1:7
     .0
                       duration time i: 3.0
                                                          demand i: 120.0
                                                                                         work load i: 120.0
                                                                                                                         work load gap i: 0
138
           V_id: 5
                              li: 7.0
                                                   xi: 19.5
                                                                         bow of i: 16.0
                                                                                                     tail of i: 23.0
                                                                                                                                 gama_i0: 0.0
                                                                                                                                                             gama_i1: 3
     .0
                       duration_time_i: 3.0
                                                          demand_i: 120.0
                                                                                         work load_i: 120.0
                                                                                                                          work load gap_i: 0
139
           V_id: 6
                                                                         bow of i: 22.0
                                                                                                     tail of i: 30.0
                                                                                                                                 gama_i0: 3.0
                              li: 8.0
                                                                                                                                                             gama_i1: 5
                       duration time i: 2.0
                                                          demand i: 120.0
                                                                                        work load i: 120.0
                                                                                                                         work load gap i: 0
     .0
140
           V_id: 7
                              li: 9.0
                                                   xi: 4.5
                                                                                                                            gama i0: 7.0
                                                                                                                                                        gama_i1: 9.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                        demand_i: 80.0
                     duration_time_i: 2.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap_i: 0
           V_id: 8
141
                              li: 3.0
                                                   xi: 1.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 3.0
                                                                                                                            gama_i0: 9.0
                                                                                                                                                        gama_i1: 11.0
                                                        demand_i: 80.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap_i: 0
                     duration time i: 2.0
          V_id: 9
                                                   xi: 1.5
                                                                       bow of i: 0.0
142
                              li: 3.0
                                                                                                   tail of i: 3.0
                                                                                                                            gama_i0: 11.0
                                                                                                                                                        gama_i1: 13.0
                    duration\_time\_i{:}~2.0
                                                                                      work load_i: 120.0
                                                                                                                       work load gap_i: 0
                                                        demand_i: 120.0
                                                     xi: 4.5
143
           V id: 10
                                li: 9.0
                                                                         bow of i: 0.0
                                                                                                     tail of i: 9.0
                                                                                                                              gama i0: 13.0
                                                                                                                                                          gama_i1: 15.
                                                       demand i: 160.0
                                                                                      work load_i: 160.0
     0
                    duration_time_i: 2.0
                                                                                                                       work load gap_i: 0
144
           V id: 11
                                 li: 9.0
                                                     xi: 4.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 9.0
                                                                                                                              gama i0: 0.0
                                                                                                                                                           gama i1: 1.0
                     duration_time_i: 1.0
                                                        demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                       work load gap_i: 0
145
146 Algorithm finished and the total CPU time: 1233 s
147 End
148
```