```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=12189
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   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.
12
13
  This is the R_2_9 standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
   Start
16
17
   Before iteration:
18
     Read basic data
19
     Parameter setting:
20
       trail = 58
21
       Pop\_size = 30
       Tolerance iteration unchanged number = 10
23
       Chrom size = 6
24
       Iter_num_GA = 300
25
       Select_rate = 0.85
26
       Crossover rate = 0.95
       Mutation rate = 0.95
27
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 2
30
       coefficient for Obj1= 1.9
       coefficient for Obj2= 0.100000000000000009
31
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 5.90 temp_best_value_gen = 5.90
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 5.90 temp_best_value_gen = 5.90
41
     No, maintain solution and obj[gen] = 5.90, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [ 4.5 11. ]
       second level: [0, 2,]
44
       third level: [4. 4.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 5.90 temp_best_value_gen = 5.90
49
50
     No, maintain solution and obj[gen] = 5.90, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [ 4.5 11. ]
53
       second level: [0. 2.]
54
       third level: [4. 4.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 5.90 temp best value gen = 5.90
59
     No, maintain solution and obj[gen] = 5.90, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [ [ 4.5 11. ]
62
       second level: [0. 2.]
       third level: [4. 4.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 5.90 temp_best_value_gen = 3.90
68
     Yes, update solution and obj[gen] = 3.90
69
     solution chromosome =
70
       first level: [ [ 4.5 11. ]
       second level: [1. 0.]
71
       third level: [2. 4.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 3.90 temp best value gen = 3.90
76
     No, maintain solution and obj[gen] = 3.90, and the tolerance_counter = 1
77
     solution chromosome =
78
       first level: [ [ 4.5 11. ]
```

```
80
           second level: [1, 0,]
 81
          third level: [2, 4,]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 3.90 temp_best_value_gen = 1.90
Yes, update solution and obj[gen] = 1.90
 85
 86
 87
        solution chromosome =
 88
          first level: [ [ 4.5 11. ]
 89
          second level: [0. 0.]
 90
          third level: [4. 4.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 1.90 temp_best_value_gen = 1.90
 95
        No, maintain solution and obj[gen] = 1.90, and the tolerance_counter = 1
 96
        solution chromosome =
 97
          first level: [ [ 4.5 11. ]
 98
          second level: [0. 0.]
 99
          third level: [4, 4,]]
100
        The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
        obj[gen-1] = 1.90 temp best value gen = 1.90
103
104
        No, maintain solution and obj[gen] = 1.90, and the tolerance_counter = 2
105
        solution chromosome =
          first level: [ [ 4.5 11. ]
106
          second level: [0. 0.]
107
          third level: [4. 4.]]
108
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 1.90 temp_best_value_gen = 1.90
113
        No, maintain solution and obj[gen] = 1.90, and the tolerance_counter = 3
        solution chromosome =
114
115
          first level: [ [ 4.5 11. ]
116
          second level: [0. 0.]
          third level: [4, 4,]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 1.90 temp_best_value_gen = 1.90
        No, maintain solution and obj[gen] = 1.90, and the tolerance_counter = 4
122
123
        solution chromosome =
124
          first level: [ [ 4.5 11. ]
125
          second level: [0. 0.]
126
          third level: [4. 4.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 1.90 temp_best_value_gen = 1.90
131
        No, maintain solution and obj[gen] = 1.90, and the tolerance_counter = 5
132
        solution chromosome =
133
          first level: [ [ 4.5 11. ]
134
          second level: [0. 0.]
135
          third level: [4, 4,]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
        obj[gen-1] = 1.90 temp_best_value_gen = 1.90
139
140
        No, maintain solution and obj[gen] = 1.90, and the tolerance_counter = 6
141
        solution chromosome =
142
          first level: [ [ 4.5 11. ]
          second level: [0. 0.]
143
          third level: [4. 4.]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 1.90 temp_best_value_gen = 1.90
149
        No, maintain solution and obj[gen] = 1.90, and the tolerance_counter = 7
150
        solution chromosome =
151
          first level: [ [ 4.5 11. ]
152
          second level: [0. 0.]
153
          third level: [4, 4,]]
154
        The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
        obj[gen-1] = 1.90 temp_best_value_gen = 1.90
158
        No, maintain solution and obj[gen] = 1.90, and the tolerance_counter = 8
159
        solution chromosome =
160
          first level: [ [ 4.5 11. ]
          second level: [0. 0.]
161
162
          third level: [4. 4.]]
        The No. 14 iteration is finished!
163
```

```
unknown
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 1.90 temp_best_value_gen = 1.90
166
167
        No, maintain solution and obj[gen] = 1.90, and the tolerance_counter = 9
168
        solution chromosome =
169
           first level: [ [ 4.5 11. ]
          second level: [0. 0.]
170
171
           third level: [4. 4.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
        obj[gen-1] = 1.90 temp_best_value_gen = 1.90
176
        No, maintain solution and obj[gen] = 1.90, and the tolerance counter = 10
177
        solution chromosome =
178
           first level: [ [ 4.5 11. ]
179
           second level: [0. 0.]
180
           third level: [4, 4,]]
181
        The No. 16 iteration is finished!
182
183
184 -----
185 The iteration is terminated and then visulize the solution:
186
        solution chromosome =
187
           first level: [ [ 4.5 11. ]
          second level: [0. 0.] third level: [4. 4.]
188
189
190
        Objective function values and some other indicators:
                                 Obj1 = 0.00
191
                                                       Obj0 + Obj1 = 1.00
           Obj0 = 1.00
192
           Total movement of crane: 0.00
193
           Total waiting time in berth position: 0.00
194
           Total index of q during berthing: 75.00
        Specific arrangement for each vessel:
195
196
           V_id: 0
                              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: 60.0
                                                                                     work load_i: 60.0
                                                                                                                      work load gap_i: 0
                                                                                                                                gama_i0: 0.0
197
                                                                         bow of i: 9.0
                                                                                                    tail of i: 13.0
           V_id: 1
                              li: 4.0
                                                   xi: 11.0
                                                                                                                                                           gama\_i1{:}\ 2
                                                          demand_i: 140.0
                                                                                        work load_i: 140.0
                                                                                                                        work load gap_i: 0
                       duration_time_i: 2.0
      .0
198
199 Algorithm finished and the total CPU time: 420 s
200 \;\; End
201
```