```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=3847
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.
   Waiting 1s.....
12
13
  This is the R_2_1 _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 = 11
21
       Pop\_size = 10
       Tolerance iteration unchanged number = 8
23
       Chrom size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.75
26
       Crossover rate = 0.8
       Mutation rate = 0.85
27
28
       Mu_oper_type = 1
29
       vessel_move_way = 2
30
       coefficient for Obj1= 1.5
       coefficient for Obj2= 0.5
31
32
       gen = 0
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 7.55 temp_best_value_gen = 7.55
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 7.55 temp_best_value_gen = 7.55
41
     No, maintain solution and obj[gen] = 7.55, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [7.04 4.28]
       second level: [0, 2,]
44
       third level: [4. 3.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
obj[gen-1] = 7.55 temp_best_value_gen = 7.50
49
50
     Yes, update solution and obj[gen] = 7.50
51
     solution chromosome =
       first level: [ [2. 8.]
52
       second level: [0.3.]
53
54
       third level: [4. 4.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 7.50 temp best value gen = 7.50
59
     No, maintain solution and obj[gen] = 7.50, and the tolerance_counter = 1
60
     solution chromosome =
61
       first level: [ [2. 8.]
62
       second level: [0.3.]
       third level: [4. 4.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 7.50 temp_best_value_gen = 7.50
68
     No, maintain solution and obj[gen] = 7.50, and the tolerance_counter = 2
69
     solution chromosome =
70
       first level: [ [2. 8.]
71
       second level: [0.3.]
       third level: [4. 4.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 7.50 temp best value gen = 7.50
76
     No, maintain solution and obj[gen] = 7.50, and the tolerance counter = 3
77
     solution chromosome =
78
       first level: [ [2. 8.]
```

```
second level: [0, 3,]
 81
          third level: [4. 4.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 7.50 temp_best_value_gen = 7.50
No, maintain solution_and_obj[gen] = 7.50, and the tolerance_counter = 4
 85
 86
 87
        solution chromosome =
 88
          first level: [ [2. 8.]
 89
          second level: [0.3.]
 90
          third level: [4. 4.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 7.50 temp_best_value_gen = 1.50
 94
 95
        Yes, update solution and obj[gen] = 1.50
 96
        solution chromosome =
 97
          first level: [ [2. 8.]
 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] = 1.50 temp best value gen = 1.50
103
104
        No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 1
105
        solution chromosome =
          first level: [ [2. 8.]
106
107
          second level: [0. 0.]
          third level: [4. 4.]]
108
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 1.50 temp_best_value_gen = 1.50
113
        No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 2
        solution chromosome =
114
115
          first level: [ [2. 8.]
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] = 1.50 temp_best_value_gen = 1.50
        No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 3
122
123
        solution chromosome =
124
          first level: [ [2. 8.]
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] = 1.50 temp_best_value_gen = 1.50
131
        No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 4
132
        solution chromosome =
133
          first level: [ [2. 8.]
134
          second level: [0. 0.]
135
          third level: [4, 4,]]
136
        The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
        obj[gen-1] = 1.50 temp_best_value_gen = 1.50
140
        No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 5
141
        solution chromosome =
142
          first level: [ [2. 8.]
143
          second level: [0. 0.]
          third level: [4. 4.]]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 1.50 temp_best_value_gen = 1.50
148
149
        No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 6
150
        solution chromosome =
151
          first level: [ [2. 8.]
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] = 1.50 temp_best_value_gen = 1.50
158
        No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 7
159
        solution chromosome =
160
          first level: [ [2. 8.]
          second level: [0, 0,]
161
162
          third level: [4. 4.]]
163
        The No. 14 iteration is finished!
```

```
unknown
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 1.50 temp_best_value_gen = 1.50
166
167
        No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 8
168
        solution chromosome =
169
          first level: [ [2. 8.]
170
          second level: [0. 0.]
171
          third level: [4. 4.]]
172
        The No. 15 iteration is finished!
173
174
175
176 The iteration is terminated and then visulize the solution:
177
        solution chromosome =
178
          first level: [ [2. 8.]
179
          second level: [0. 0.]
180
          third level: [4. 4.]
181
        Objective function values and some other indicators:
          Obj0 = 1.00
                                                      Obj0 + Obj1 = 1.00
182
                                Obj1 = 0.00
183
          Total movement of crane: 0.00
184
          Total waiting time in berth position: 0.00
185
          Total index of q during berthing: 43.00
186
        Specific arrangement for each vessel:
                                                                                                tail of i: 4.0
187
                             li: 4.0
                                                                                                                        gama i0: 0.0
          V_id: 0
                                                  xi: 2.0
                                                                     bow of i: 0.0
                                                                                                                                                   gama_i1: 2.0
                    duration\_time\_i{:}~2.0
                                                      demand_i: 160.0
                                                                                    work load_i: 160.0
                                                                                                                   work load gap_i: 0
          V_id: 1
188
                                                  xi: 8.0
                                                                     bow of i: 4.0
                                                                                                tail of i: 12.0
                             li: 8.0
                                                                                                                          gama_i0: 0.0
                                                                                                                                                      gama_i1: 2.0
                    duration_time_i: 2.0
                                                      demand i: 120.0
                                                                                    work load_i: 120.0
                                                                                                                   work load gap_i: 0
189
190 Algorithm finished and the total CPU time: 149 s
191 End
192
```