```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=4830
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 = 56
       Pop\_size = 20
21
       Tolerance iteration unchanged number = 10
23
       Chrom size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.75
26
       Crossover rate = 0.85
       Mutation rate = 0.85
27
28
       Mu_oper_type = 2
29
       vessel\_move\_way = 1
30
       coefficient for Obj1= 0.5
       coefficient for Obj2= 1.5
31
       gen = 0
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 7.50 temp_best_value_gen = 7.50
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 7.50 temp_best_value_gen = 7.50
41
     No, maintain solution and obj[gen] = 7.50, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [2. 8.]
       second level: [3, 0,]
44
       third level: [2. 3.]]
45
     The No. 1 iteration is finished!
46
47
   Beging the No. 2 iteration:
obj[gen-1] = 7.50 temp_best_value_gen = 7.50
48
49
50
     No, maintain solution and obj[gen] = 7.50, and the tolerance_counter = 2
51
     solution chromosome =
       first level: [ [2. 8.]
52
       second level: [3. 0.]
53
54
       third level: [2. 3.]]
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 = 3
60
     solution chromosome =
61
       first level: [ [2. 8.]
62
       second level: [3. 0.]
       third level: [2. 3.]]
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 = 6.90
68
     Yes, update solution and obj[gen] = 6.90
69
     solution chromosome =
70
       first level: [ [2.16 4.04]
71
       second level: [1. 0.]
       third level: [4. 6.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obj[gen-1] = 6.90 temp_best_value_gen = 6.90
76
     No. maintain solution and obj[gen] = 6.90, and the tolerance_counter = 1
77
     solution chromosome =
78
       first level: [ [2.16 4.04]
```

```
80
          second level: [1, 0,]
 81
          third level: [4. 6.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 6.90 temp best value gen = 6.90
 86
       No, maintain solution and obj[gen] = 6.90, and the tolerance_counter = 2
 87
        solution chromosome =
 88
          first level: [[2.16 4.04]
 89
          second level: [1. 0.]
 90
          third level: [4. 6.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 6.90 temp_best_value_gen = 6.21
 95
        Yes, update solution and obj[gen] = 6.21
 96
       solution chromosome =
 97
          first level: [ [2. 6.04]
          second level: [0. 2.]
 98
 99
          third level: [4. 7.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103
       obj[gen-1] = 6.21 temp best value gen = 6.21
104
       No, maintain solution and obj[gen] = 6.21, and the tolerance_counter = 1
105
        solution chromosome =
          first level: [ [2. 6.04]
106
107
          second level: [0. 2.]
108
          third level: [4. 7.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 6.21 temp_best_value_gen = 6.21
113
       No, maintain solution and obj[gen] = 6.21, and the tolerance_counter = 2
       solution chromosome =
114
115
          first level: [ [2. 6.04]
          second level: [0. 2.]
116
          third level: [4, 7,]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 6.21 temp_best_value_gen = 6.21
122
       No, maintain solution and obj[gen] = 6.21, and the tolerance_counter = 3
123
        solution chromosome =
124
          first level: [ [2. 6.04]
125
          second level: [0. 2.]
126
          third level: [4. 7.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 6.21 temp_best_value_gen = 6.21
131
       No, maintain solution and obj[gen] = 6.21, and the tolerance_counter = 4
132
       solution chromosome =
133
          first level: [ [2. 6.04]
134
          second level: [0. 2.]
135
          third level: [4. 7.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 6.21 temp_best_value_gen = 6.21
140
       No, maintain solution and obj[gen] = 6.21, and the tolerance_counter = 5
141
        solution chromosome =
142
          first level: [ [2. 6.04]
143
          second level: [0. 2.]
          third level: [4. 7.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 6.21 temp_best_value_gen = 6.21
148
149
       No, maintain solution and obj[gen] = 6.21, and the tolerance_counter = 6
150
       solution chromosome =
151
          first level: [ [2. 6.04]
152
          second level: [0. 2.]
153
          third level: [4. 7.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 6.21 temp_best_value_gen = 6.21
158
       No, maintain solution and obj[gen] = 6.21, and the tolerance_counter = 7
159
        solution chromosome =
160
          first level: [ [2. 6.04]
          second level: [0. 2.]
161
162
          third level: [4. 7.]]
163
       The No. 14 iteration is finished!
```

```
unknown
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 6.21 temp_best_value_gen = 6.21
166
167
        No, maintain solution and obj[gen] = 6.21, and the tolerance_counter = 8
168
        solution chromosome =
169
           first level: [ [2. 6.04]
           second level: [0. 2.]
170
171
           third level: [4. 7.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
        obj[gen-1] = 6.21 temp_best_value_gen = 6.21
176
        No, maintain solution and obj[gen] = 6.21, and the tolerance counter = 9
177
        solution chromosome =
           first level: [ [2. 6.04]
178
179
           second level: [0. 2.]
180
           third level: [4. 7.]]
181
        The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
184
        obj[gen-1] = 6.21 temp_best_value_gen = 6.21
185
        No, maintain solution and obj[gen] = 6.21, and the tolerance_counter = 10
186
        solution chromosome =
187
           first level: [ [2. 6.04]
188
           second level: [0. 2.]
           third level: [4. 7.]]
189
190
        The No. 17 iteration is finished!
191
192
193
194 The iteration is terminated and then visulize the solution:
195
        solution chromosome =
196
           first level: [ [2. 6.04]
197
           second level: [0. 2.]
           third level: [4. 7.]]
198
199
        Objective function values and some other indicators:
200
           Obj0 = 2.00
                                Obj1 = 3.48
                                                      Obj0 + Obj1 = 5.48
201
           Total movement of crane: 1.48
202
           Total waiting time in berth position: 2.00
           Total index of q during berthing: 39.00
203
204
        Specific arrangement for each vessel:
205
           V_id: 0
                             li: 4.0
                                                 xi: 2.0
                                                                     bow of i: 0.0
                                                                                                tail of i: 4.0
                                                                                                                        gama i0: 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
                                                                     bow of i: 2.0
206
           V id: 1
                              li: 8.0
                                                  xi: 6.0
                                                                                                tail of i: 10.0
                                                                                                                           gama_i0: 2.0
                                                                                                                                                      gama_i1: 3.0
                    duration_time_i: 1.0
                                                      demand_i: 120.0
                                                                                    work load_i: 120.0
                                                                                                                    work load gap_i: 0
208 Algorithm finished and the total CPU time: 299 s
209 End
210
```