```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=25098
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 = 46
21
       Pop\_size = 10
       Tolerance iteration unchanged number = 6
23
       Chrom\_size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.8
26
       Crossover rate = 0.75
       Mutation rate = 0.75
27
28
       Mu_oper_type = 2
29
       vessel\_move\_way = 1
30
       coefficient for Obj1= 1.5
       coefficient for Obj2= 0.5
31
       gen = 0
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 11.93 temp_best_value_gen = 11.93
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 11.93 temp_best_value_gen = 11.93
41
     No, maintain solution and obj[gen] = 11.93, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [2.34 6.06]
       second level: [4, 0,]
44
       third level: [4. 7.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 11.93 temp_best_value_gen = 11.93
49
50
     No, maintain solution and obj[gen] = 11.93, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [2.34 6.06]
53
       second level: [4. 0.]
54
       third level: [4. 7.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 11.93 temp best value gen = 9.95
     Yes, update solution and obj[gen] = 9.95
59
60
     solution chromosome =
61
       first level: [ [2.03 4.26]
62
       second level: [0. 2.]
       third level: [4. 7.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 9.95 temp_best_value_gen = 9.95
68
     No, maintain solution and obj[gen] = 9.95, and the tolerance_counter = 1
69
     solution chromosome =
70
       first level: [ [2.03 4.26]
       second level: [0. 2.]
71
       third level: [4. 7.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 9.95 temp best value gen = 7.88
76
     Yes, update solution and obj[gen] = 7.88
77
     solution chromosome =
78
       first level: [ [2.3 4.17]
```

```
second level: [1, 0,]
 81
          third level: [4. 7.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 7.88 temp_best_value_gen = 7.88
No, maintain solution_and_obj[gen] = 7.88, and the tolerance_counter = 1
 85
 86
 87
        solution chromosome =
 88
          first level: [ [2.3 4.17]
 89
          second level: [1. 0.]
 90
          third level: [4. 7.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 7.88 temp_best_value_gen = 7.88
 95
        No, maintain solution and obj[gen] = 7.88, and the tolerance_counter = 2
 96
        solution chromosome =
 97
          first level: [ [2.3 4.17]
 98
          second level: [1. 0.]
 99
          third level: [4. 7.]]
100
        The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
        obj[gen-1] = 7.88 temp best value gen = 7.88
103
104
        No, maintain solution and obj[gen] = 7.88, and the tolerance_counter = 3
105
        solution chromosome =
          first level: [[2.3 4.17]
106
          second level: [1. 0.]
107
108
          third level: [4. 7.]]
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 7.88 temp_best_value_gen = 7.88
113
        No, maintain solution and obj[gen] = 7.88, and the tolerance_counter = 4
        solution chromosome =
114
115
          first level: [ [2.3 4.17]
116
          second level: [1. 0.]
          third level: [4, 7,]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 7.88 \quad temp\_best\_value\_gen = 7.88
        No, maintain solution and obj[gen] = 7.88, and the tolerance_counter = 5
122
123
        solution chromosome =
124
          first level: [[2.3 4.17]
125
          second level: [1. 0.]
126
          third level: [4. 7.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 7.88 temp_best_value_gen = 7.35
131
        Yes, update solution and obj[gen] = 7.35
132
        solution chromosome =
133
          first level: [ [2.11 4.17]
134
          second level: [1. 0.]
135
          third level: [4. 7.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
        obj[gen-1] = 7.35 temp_best_value_gen = 7.35
139
140
        No, maintain solution and obj[gen] = 7.35, and the tolerance_counter = 1
141
        solution chromosome =
142
          first level: [ [2.11 4.17]
          second level: [1. 0.]
143
          third level: [4. 7.]]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 7.35 temp_best_value_gen = 7.35
148
149
        No, maintain solution and obj[gen] = 7.35, and the tolerance_counter = 2
150
        solution chromosome =
151
          first level: [ [2.11 4.17]
152
          second level: [1. 0.]
153
          third level: [4. 7.]]
154
        The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
        obj[gen-1] = 7.35 temp_best_value_gen = 7.35
158
        No, maintain solution and obj[gen] = 7.35, and the tolerance_counter = 3
159
        solution chromosome =
160
          first level: [[2.11 4.17]
          second level: [1. 0.]
161
162
          third level: [4. 7.]]
163
        The No. 14 iteration is finished!
```

```
164
165 Beging the No. 15 iteration:
       obj[gen-1] = 7.35 temp_best_value_gen = 7.35
166
       No, maintain solution and obj[gen] = 7.35, and the tolerance_counter = 4
167
168
       solution chromosome =
169
          first level: [ [2.11 4.17]
170
          second level: [1. 0.]
171
          third level: [4. 7.]]
172
       The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
       obj[gen-1] = 7.35 temp_best_value_gen = 7.35
176
       No, maintain solution and obj[gen] = 7.35, and the tolerance counter = 5
177
       solution chromosome =
          first level: [ [2.11 4.17]
178
179
          second level: [1. 0.]
          third level: [4. 7.]]
180
181
       The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
       obj[gen-1] = 7.35 temp_best_value_gen = 7.35
184
185
       No, maintain solution and obj[gen] = 7.35, and the tolerance_counter = 6
186
       solution chromosome =
187
          first level: [ [2.11 4.17]
          second level: [1. 0.]
188
          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: [ [2.11 4.17]
197
          second level: [1. 0.]
          third level: [4. 7.]
198
199
       Objective function values and some other indicators:
200
          Obj0 = 2.00
                               Obj1 = 8.70
                                                      Obj0 + Obj1 = 10.70
201
          Total movement of crane: 7.70
202
          Total waiting time in berth position: 1.00
          Total index of q during berthing: 27.00
203
204
        Specific arrangement for each vessel:
205
          V_id: 0
                             li: 4.0
                                                 xi: 2.1
                                                                     bow of i: 0.1
                                                                                                tail of i: 4.1
                                                                                                                        gama i0: 1.0
                                                                                                                                                    gama_i1: 3.0
                    duration\_time\_i{:}~2.0
                                                      demand_i: 160.0
                                                                                    work load_i: 160.0
                                                                                                                    work load gap_i: 0
                                                                     bow of i: 0.2
206
          V id: 1
                             li: 8.0
                                                 xi: 4.2
                                                                                                tail of i: 8.2
                                                                                                                        gama_i0: 0.0
                                                                                                                                                    gama_i1: 1.0
                    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: 143 s
209 End
210
```