```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=21518
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
     01_My_Python_Code', 'E:/1 \\ \text{0} \\ \
     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 = 48
21
            Pop\_size = 30
             Tolerance iteration unchanged number = 6
23
             Chrom\_size = 6
            Iter_num_GA = 300
24
25
             Select_rate = 0.9
26
             Crossover rate = 0.8
27
             Mutation rate = 0.85
28
             Mu_oper_type = 1
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] = 9.06 temp_best_value_gen = 9.06
36
37
         The No. 0 iteration is finished!
38
39
     Beging the No. 1 iteration:
40
         obj[gen-1] = 9.06 temp_best_value_gen = 9.06
41
         No, maintain solution and obj[gen] = 9.06, and the tolerance_counter = 1
42
         solution chromosome =
43
             first level: [[3.37 4.]
            second level: [3. 0.]
44
            third level: [4. 6.]]
45
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
         obj[gen-1] = 9.06 temp_best_value_gen = 7.06
49
50
         Yes, update solution and obj[gen] = 7.06
51
         solution chromosome =
52
             first level: [ [4. 4.37]
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] = 7.06 temp best value gen = 7.06
59
         No, maintain solution and obj[gen] = 7.06, and the tolerance_counter = 1
60
         solution chromosome =
61
             first level: [ [4. 4.37]
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] = 7.06 temp_best_value_gen = 7.06
68
         No, maintain solution and obj[gen] = 7.06, and the tolerance_counter = 2
69
         solution chromosome =
70
            first level: [ [4. 4.37]
             second level: [0. 2.]
71
            third level: [4. 4.]]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obj[gen-1] = 7.06 temp_best_value_gen = 7.06
76
         No, maintain solution and obj[gen] = 7.06, and the tolerance_counter = 3
77
78
         solution chromosome =
             first level: [ [4. 4.37]
```

```
80
           second level: [0, 2,]
 81
          third level: [4. 4.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 7.06 temp_best_value_gen = 7.06
No, maintain solution_and_obj[gen] = 7.06, and the tolerance_counter = 4
 85
 86
 87
        solution chromosome =
 88
          first level: [ [4. 4.37]
          second level: [0, 2.]
 89
 90
          third level: [4. 4.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 7.06 temp_best_value_gen = 5.50
 95
        Yes, update solution and obj[gen] = 5.50
 96
        solution chromosome =
 97
          first level: [ [2. 8.]
 98
          second level: [0. 2.]
 99
          third level: [4, 4,]]
100
        The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
        obj[gen-1] = 5.50 temp best value gen = 5.50
103
104
        No, maintain solution and obj[gen] = 5.50, and the tolerance_counter = 1
105
        solution chromosome =
          first level: [ [2. 8.]
106
107
          second level: [0. 2.]
          third level: [4. 4.]]
108
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 5.50 temp_best_value_gen = 5.50
113
        No, maintain solution and obj[gen] = 5.50, and the tolerance_counter = 2
        solution chromosome =
114
115
          first level: [ [2. 8.]
116
          second level: [0. 2.]
          third level: [4, 4,]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
        obj[gen-1] = 5.50 temp_best_value_gen = 5.50
121
        No, maintain solution and obj[gen] = 5.50, and the tolerance_counter = 3
122
123
        solution chromosome =
124
          first level: [ [2. 8.]
125
          second level: [0. 2.]
126
          third level: [4. 4.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 5.50 temp_best_value_gen = 3.50
130
131
        Yes, update solution and obj[gen] = 3.50
132
        solution chromosome =
133
          first level: [ [2. 8.]
134
          second level: [0. 1.]
135
          third level: [4, 4,]]
136
        The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
140
        No, maintain solution and obj[gen] = 3.50, and the tolerance_counter = 1
141
        solution chromosome =
142
          first level: [ [2. 8.]
143
          second level: [0.1.]
          third level: [4. 4.]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
148
149
        No, maintain solution and obj[gen] = 3.50, and the tolerance_counter = 2
150
        solution chromosome =
151
          first level: [ [2. 8.]
152
          second level: [0. 1.]
153
          third level: [4, 4,]]
154
        The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
158
        No, maintain solution and obj[gen] = 3.50, and the tolerance_counter = 3
159
        solution chromosome =
160
          first level: [ [2. 8.]
          second level: [0, 1,]
161
162
          third level: [4. 4.]]
163
        The No. 14 iteration is finished!
```

```
unknown
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
166
167
        No, maintain solution and obj[gen] = 3.50, and the tolerance_counter = 4
168
        solution chromosome =
169
           first level: [ [2. 8.]
170
           second level: [0. 1.]
171
           third level: [4. 4.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
176
        No, maintain solution and obj[gen] = 3.50, and the tolerance counter = 5
177
        solution chromosome =
178
           first level: [ [2. 8.]
179
           second level: [0. 1.]
180
           third level: [4, 4,]]
181
        The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
184
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
185
        No, maintain solution and obj[gen] = 3.50, and the tolerance_counter = 6
186
        solution chromosome =
187
           first level: [ [2. 8.]
188
           second level: [0. 1.]
           third level: [4. 4.]]
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. 8.]
197
           second level: [0. 1.]
           third level: [4. 4.]]
198
199
        Objective function values and some other indicators:
200
           Obj0 = 2.00
                                Obj1 = 1.00
                                                       Obj0 + Obj1 = 3.00
201
           Total movement of crane: 0.00
202
           Total waiting time in berth position: 1.00
           Total index of q during berthing: 43.00
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: 4.0
206
           V id: 1
                              li: 8.0
                                                  xi: 8.0
                                                                                                tail of i: 12.0
                                                                                                                            gama_i0: 1.0
                                                                                                                                                       gama_i1: 3.0
                    duration_time_i: 2.0
                                                       demand_i: 120.0
                                                                                    work load_i: 120.0
                                                                                                                    work load gap_i: 0
208 Algorithm finished and the total CPU time: 454 s
209 End
210
```