```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=8238
 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')
    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 = 28
21
            Pop\_size = 30
             Tolerance iteration unchanged number = 8
23
             Chrom\_size = 6
            Iter_num_GA = 300
24
25
             Select_rate = 0.95
26
             Crossover rate = 0.8
27
             Mutation rate = 0.75
28
             Mu_oper_type = 1
29
             vessel\_move\_way = 2
30
            coefficient for Obj1= 1.0
            coefficient for Obj2= 1.0
31
             gen = 0
32
33
     Iteration begin:
34
35
     Beging the No. 0 iteration:
         obj[0] = 10.11 temp_best_value_gen = 10.11
36
37
         The No. 0 iteration is finished!
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 10.11 temp_best_value_gen = 10.11
40
41
         No, maintain solution and obj[gen] = 10.11, and the tolerance_counter = 1
42
         solution chromosome =
43
             first level: [ [2.09 6.07]
            second level: [0, 3,]
44
            third level: [3. 6.]]
45
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
         obj[gen-1] = 10.11 temp_best_value_gen = 10.11
49
50
         No, maintain solution and obj[gen] = 10.11, and the tolerance_counter = 2
51
         solution chromosome =
52
             first level: [ [2.09 6.07]
53
             second level: [0.3.]
54
            third level: [3. 6.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 10.11 temp best value gen = 10.11
59
         No, maintain solution and obj[gen] = 10.11, and the tolerance_counter = 3
60
         solution chromosome =
61
             first level: [ [2.09 6.07]
62
             second level: [0.3.]
            third level: [3. 6.]]
63
64
         The No. 3 iteration is finished!
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 10.11 temp_best_value_gen = 10.11
68
         No, maintain solution and obj[gen] = 10.11, and the tolerance_counter = 4
69
         solution chromosome =
70
            first level: [ [2.09 6.07]
             second level: [0.3.]
71
            third level: [3. 6.]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obi[gen-1] = 10.11 temp best value gen = 7.00
76
         Yes, update solution and obj[gen] = 7.00
77
         solution chromosome =
78
             first level: [ [2. 8.]
```

```
second level: [1, 3,]
 81
          third level: [4. 8.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 7.00 temp_best_value_gen = 7.00
No, maintain solution_and obj[gen] = 7.00, and the tolerance_counter = 1
 85
 86
 87
        solution chromosome =
 88
          first level: [ [2. 8.]
 89
          second level: [1. 3.]
 90
          third level: [4. 8.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 7.00 temp_best_value_gen = 7.00
 94
 95
        No, maintain solution and obj[gen] = 7.00, and the tolerance_counter = 2
 96
        solution chromosome =
 97
          first level: [ [2. 8.]
 98
          second level: [1.3.]
 99
          third level: [4. 8.]]
100
        The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
        obj[gen-1] = 7.00 temp best value gen = 7.00
103
104
        No, maintain solution and obj[gen] = 7.00, and the tolerance_counter = 3
105
        solution chromosome =
          first level: [ [2. 8.]
106
107
          second level: [1.3.]
108
          third level: [4. 8.]]
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 7.00 temp_best_value_gen = 7.00
113
        No, maintain solution and obj[gen] = 7.00, and the tolerance_counter = 4
        solution chromosome =
114
115
          first level: [ [2. 8.]
116
          second level: [1.3.]
          third level: [4, 8,]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 7.00 temp_best_value_gen = 7.00
        No, maintain solution and obj[gen] = 7.00, and the tolerance_counter = 5
122
123
        solution chromosome =
124
          first level: [ [2. 8.]
125
          second level: [1. 3.]
126
          third level: [4. 8.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 7.00 temp_best_value_gen = 7.00
131
        No, maintain solution and obj[gen] = 7.00, and the tolerance_counter = 6
132
        solution chromosome =
133
          first level: [ [2. 8.]
134
          second level: [1.3.]
135
          third level: [4. 8.]]
136
        The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
        obj[gen-1] = 7.00 temp_best_value gen = 3.00
139
140
        Yes, update solution and obj[gen] = 3.00
141
        solution chromosome =
142
          first level: [ [2. 8.]
          second level: [1. 0.]
143
          third level: [4. 2.]]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 3.00 temp_best_value_gen = 3.00
148
149
        No, maintain solution and obj[gen] = 3.00, and the tolerance_counter = 1
150
        solution chromosome =
151
          first level: [ [2. 8.]
152
          second level: [1. 0.]
153
          third level: [4. 2.]]
154
        The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
        obj[gen-1] = 3.00 temp_best_value_gen = 3.00
158
        No, maintain solution and obj[gen] = 3.00, and the tolerance_counter = 2
159
        solution chromosome =
160
          first level: [ [2. 8.]
          second level: [1. 0.]
161
162
          third level: [4. 2.]]
163
        The No. 14 iteration is finished!
```

```
164
165 Beging the No. 15 iteration:
       obj[gen-1] = 3.00 temp_best_value_gen = 3.00
166
167
       No, maintain solution and obj[gen] = 3.00, and the tolerance_counter = 3
168
        solution chromosome =
169
          first level: [ [2, 8.]
170
          second level: [1. 0.]
171
          third level: [4. 2.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
       obj[gen-1] = 3.00 temp_best_value_gen = 3.00
       No, maintain solution and obj[gen] = 3.00, and the tolerance counter = 4
176
177
       solution chromosome =
178
          first level: [ [2. 8.]
179
          second level: [1. 0.]
180
          third level: [4. 2.]]
181
        The No. 16 iteration is finished!
182
183
     Beging the No. 17 iteration:
       obj[gen-1] = 3.00 temp_best_value_gen = 3.00
184
185
       No, maintain solution and obj[gen] = 3.00, and the tolerance_counter = 5
186
        solution chromosome =
187
          first level: [ [2. 8.]
          second level: [1. 0.]
188
          third level: [4. 2.]]
189
190
        The No. 17 iteration is finished!
191
192
     Beging the No. 18 iteration:
193
       obj[gen-1] = 3.00 temp_best_value_gen = 3.00
194
       No, maintain solution and obj[gen] = 3.00, and the tolerance counter = 6
195
       solution chromosome =
196
          first level: [ [2. 8.]
197
          second level: [1. 0.]
198
          third level: [4. 2.]]
199
       The No. 18 iteration is finished!
200
201 Beging the No. 19 iteration:
202
       obj[gen-1] = 3.00 temp_best_value_gen = 3.00
203
        No, maintain solution and obj[gen] = 3.00, and the tolerance_counter = 7
204
        solution chromosome =
205
          first level: [ [2. 8.]
          second level: [1. 0.]
206
207
          third level: [4. 2.]]
208
        The No. 19 iteration is finished!
209
210 Beging the No. 20 iteration:
211
       obj[gen-1] = 3.00 temp_best_value_gen = 3.00
212
       No, maintain solution and obj[gen] = 3.00, and the tolerance_counter = 8
       solution chromosome =
213
214
          first level: [ [2. 8.]
215
          second level: [1. 0.]
216
          third level: [4. 2.]]
       The No. 20 iteration is finished!
217
218
219
220
221 The iteration is terminated and then visulize the solution:
222
       solution chromosome
223
          first level: [ [2. 8.]
224
          second level: [1. 0.]
225
          third level: [4. 2.]]
226
        Objective function values and some other indicators:
227
          Obio = 2.00
                               Obj1 = 1.00
                                                      Obj0 + Obj1 = 3.00
228
          Total movement of crane: 0.00
229
          Total waiting time in berth position: 1.00
230
          Total index of q during berthing: 39.00
231
        Specific arrangement for each vessel:
232
          V_id: 0
                             li: 4.0
                                                  xi: 2.0
                                                                     bow of i: 0.0
                                                                                                tail of i: 4.0
                                                                                                                         gama_i0: 1.0
                                                                                                                                                    gama_i1: 3.0
                                                      demand_i: 160.0
                                                                                                                    work load gap_i: 0
                    duration_time_i: 2.0
                                                                                    work load_i: 160.0
233
          V_id: 1
                                                                     bow of i: 4.0
                                                                                                tail of i: 12.0
                                                                                                                           gama_i0: 0.0
                             li: 8.0
                                                 xi: 8.0
                                                                                                                                                       gama_i1: 3.0
                                                                                    work load_i: 120.0
                    duration\_time\_i{:}~3.0
                                                      demand_i: 120.0
                                                                                                                    work load gap_i: 0
235 Algorithm finished and the total CPU time: 508 s
236 End
237
```