```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=5096
 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 = 57
21
             Pop\_size = 10
             Tolerance iteration unchanged number = 10
23
             Chrom\_size = 6
             Iter_num_GA = 300
24
25
             Select_rate = 0.8
26
             Crossover rate = 0.9
27
             Mutation rate = 0.9
28
             Mu_oper_type = 2
29
             vessel\_move\_way = 2
30
             coefficient for Obj1= 1.9
             coefficient for Obj2= 0.100000000000000009
31
32
33
34
      Iteration begin:
35
     Beging the No. 0 iteration:
         obj[0] = 7.90 temp_best_value_gen = 7.90
36
37
         The No. 0 iteration is finished!
38
39
     Beging the No. 1 iteration:
40
         obj[gen-1] = 7.90 temp_best_value_gen = 5.46
         Yes, update solution and obj[gen] = 5.46
41
         solution chromosome =
42
43
             first level: [ [2. 4.34]
             second level: [1. 0.]
44
45
             third level: [4. 7.]]
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
         obj[gen-1] = 5.46 temp_best_value_gen = 5.46
49
50
         No, maintain solution and obj[gen] = 5.46, and the tolerance_counter = 1
51
         solution chromosome =
52
             first level: [ [2. 4.34]
53
             second level: [1. 0.]
54
             third level: [4. 7.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 5.46 temp best value gen = 5.46
59
         No, maintain solution and obj[gen] = 5.46, and the tolerance_counter = 2
60
         solution chromosome =
61
             first level: [ [2. 4.34]
62
             second level: [1. 0.]
63
             third level: [4. 7.]]
64
         The No. 3 iteration is finished!
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 5.46 temp_best_value_gen = 5.46
68
         No, maintain solution and obj[gen] = 5.46, and the tolerance_counter = 3
69
         solution chromosome =
             first level: [ [2. 4.34] second level: [1. 0.]
70
71
             third level: [4. 7.]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obj[gen-1] = 5.46 temp_best_value_gen = 5.46
76
         No, maintain solution and obj[gen] = 5.46, and the tolerance_counter = 4
77
78
         solution chromosome =
             first level: [ [2. 4.34]
```

```
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] = 5.46 temp_best_value_gen = 5.46
No, maintain solution_and_obj[gen] = 5.46, and the tolerance_counter = 5
 85
 86
 87
        solution chromosome =
 88
          first level: [ [2. 4.34]
          second level: [1, 0.]
 89
 90
          third level: [4. 7.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 5.46 temp_best_value_gen = 5.46
 95
        No, maintain solution and obj[gen] = 5.46, and the tolerance_counter = 6
 96
        solution chromosome =
 97
          first level: [ [2. 4.34]
 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] = 5.46 temp best value gen = 5.46
103
104
        No, maintain solution and obj[gen] = 5.46, and the tolerance_counter = 7
105
        solution chromosome =
          first level: [ [2. 4.34]
106
107
          second level: [1. 0.]
108
          third level: [4. 7.]]
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 5.46 temp_best_value_gen = 5.46
113
        No, maintain solution and obj[gen] = 5.46, and the tolerance_counter = 8
        solution chromosome =
114
          first level: [ [2. 4.34] second level: [1. 0.]
115
116
117
          third level: [4. 7.]]
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 5.46 temp_best_value_gen = 5.46
        No, maintain solution and obj[gen] = 5.46, and the tolerance_counter = 9
122
123
        solution chromosome =
124
          first level: [ [2. 4.34]
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] = 5.46 temp_best_value_gen = 4.16
131
        Yes, update solution and obj[gen] = 4.16
132
        solution chromosome =
133
          first level: [ [2. 4.06]
134
          second level: [1. 0.]
135
          third level: [4. 7.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
        obj[gen-1] = 4.16 temp_best_value_gen = 4.16
140
        No, maintain solution and obj[gen] = 4.16, and the tolerance_counter = 1
141
        solution chromosome =
142
          first level: [ [2. 4.06]
143
          second level: [1. 0.]
          third level: [4. 7.]]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 4.16 temp_best_value_gen = 4.16
148
149
        No, maintain solution and obj[gen] = 4.16, and the tolerance_counter = 2
150
        solution chromosome =
151
          first level: [ [2. 4.06]
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] = 4.16 temp_best_value_gen = 4.07
158
        Yes, update solution and obj[gen] = 4.07
159
        solution chromosome =
160
          first level: [ [2. 4.04]
          second level: [1. 0.]
161
162
          third level: [4. 8.]]
163
        The No. 14 iteration is finished!
```

```
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 4.07 temp_best_value_gen = 4.07
166
167
       No, maintain solution and obj[gen] = 4.07, and the tolerance_counter = 1
       solution chromosome =
168
169
          first level: [ [2. 4.04]
170
          second level: [1. 0.]
171
          third level: [4. 8.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
       obj[gen-1] = 4.07 temp_best_value_gen = 4.07
       No, maintain solution and obj[gen] = 4.07, and the tolerance counter = 2
176
177
       solution chromosome =
178
          first level: [ [2. 4.04]
179
          second level: [1. 0.]
180
          third level: [4. 8.]]
181
       The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
       obj[gen-1] = 4.07 temp_best_value_gen = 4.07
184
185
       No, maintain solution and obj[gen] = 4.07, and the tolerance_counter = 3
186
        solution chromosome =
187
          first level: [ [2. 4.04]
188
          second level: [1. 0.]
189
          third level: [4. 8.]]
190
       The No. 17 iteration is finished!
191
192 Beging the No. 18 iteration:
193
       obj[gen-1] = 4.07 temp_best_value_gen = 4.07
194
       No, maintain solution and obj[gen] = 4.07, and the tolerance counter = 4
195
       solution chromosome =
196
          first level: [ [2. 4.04]
197
          second level: [1. 0.]
198
          third level: [4. 8.]]
199
       The No. 18 iteration is finished!
200
201 Beging the No. 19 iteration:
202
       obj[gen-1] = 4.07 temp_best_value_gen = 4.07
203
       No, maintain solution and obj[gen] = 4.07, and the tolerance_counter = 5
204
       solution chromosome =
205
          first level: [ [2. 4.04]
          second level: [1. 0.]
206
207
          third level: [4. 8.]]
208
        The No. 19 iteration is finished!
209
210 Beging the No. 20 iteration:
211
       obj[gen-1] = 4.07 temp_best_value_gen = 4.07
212
       No, maintain solution and obj[gen] = 4.07, and the tolerance_counter = 6
213
       solution chromosome =
214
          first level: [ [2. 4.04]
215
          second level: [1. 0.]
216
          third level: [4. 8.]]
217
       The No. 20 iteration is finished!
218
219 Beging the No. 21 iteration:
       obj[gen-1] = 4.07 temp best value gen = 4.07
220
221
       No, maintain solution and obj[gen] = 4.07, and the tolerance_counter = 7
222
       solution chromosome
223
          first level: [ [2. 4.04]
224
          second level: [1. 0.]
225
          third level: [4. 8.]]
226
       The No. 21 iteration is finished!
227
228 Beging the No. 22 iteration:
229
       obj[gen-1] = 4.07 temp_best_value_gen = 4.07
230
       No, maintain solution and obj[gen] = 4.07, and the tolerance_counter = 8
231
       solution chromosome =
232
          first level: [ [2. 4.04]
233
          second level: [1. 0.]
234
          third level: [4. 8.]
235
       The No. 22 iteration is finished!
236
237 Beging the No. 23 iteration:
238
       obj[gen-1] = 4.07 temp_best_value_gen = 4.07
239
       No, maintain solution and obj[gen] = 4.07, and the tolerance_counter = 9
240
       solution chromosome
241
          first level: [ [2. 4.04]
242
          second level: [1. 0.]
243
          third level: [4. 8.]]
244
       The No. 23 iteration is finished!
245
246 Beging the No. 24 iteration:
       obj[gen-1] = 4.07 temp_best_value_gen = 4.07
247
```

```
unknown
        No, maintain solution and obj[gen] = 4.07, and the tolerance_counter = 10
248
249
        solution chromosome =
           first level: [ [2. 4.04] second level: [1. 0.]
250
251
252
           third level: [4. 8.]]
253
        The No. 24 iteration is finished!
254
255
256
257 The iteration is terminated and then visulize the solution:
258
        solution chromosome =
           first level: [ [2. 4.04] second level: [1. 0.]
259
260
261
           third level: [4. 8.]]
262
        Objective function values and some other indicators:
263
           Obj0 = 2.00
                                 Obj1 = 2.67
                                                        Obj0 + Obj1 = 4.67
264
           Total movement of crane: 1.67
           Total waiting time in berth position: 1.00
265
266
           Total index of q during berthing: 27.00
267
        Specific arrangement for each vessel:
                                                   xi: 2.0
                                                                                                   tail of i: 4.0
268
                              li: 4.0
                                                                        bow of i: 0.0
                                                                                                                             gama_i0: 1.0
                                                                                                                                                         gama_i1: 3.0
           V_id: 0
                     duration_time_i: 2.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
           V_id: 1
                                                                        bow of i: 0.0
269
                               1i: 8.0
                                                   xi: 4.0
                                                                                                   tail of i: 8.0
                                                                                                                             gama_i0: 0.0
                                                                                                                                                         gama_i1: 1.0
                                                        demand_i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                        work load gap_i: 0
                     duration_time_i: 1.0
270
271 Algorithm finished and the total CPU time: 208 s
272 End
273
```