```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=52351
 2
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
     01_My_Python_Code', 'E:/1 \\ \text{0} \\ \
     01_My_Python_Code'])
 5
 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_7_2 standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
     Start
16
17
     Before iteration:
         Read basic data
18
19
         Parameter setting:
20
            trail = 58
21
             Pop_size = 30
             Tolerance iteration unchanged number = 10
23
             Chrom\_size = 21
            Iter_num_GA = 300
24
25
             Select_rate = 0.85
26
             Crossover rate = 0.95
27
             Mutation rate = 0.95
28
             Mu_oper_type = 1
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] = 13.60 temp_best_value_gen = 13.60
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 13.60 temp_best_value_gen = 13.60
40
         No, maintain solution and obj[gen] = 13.60, and the tolerance_counter = 1
41
42
         solution chromosome =
43
             first level: [ [ 2. 5.5 11.5 18. 22.5 26.5 2. ]
             second level: [0. 2. 1. 1. 2. 0. 3.]
44
45
            third level: [4. 3. 8. 3. 2. 4. 1.]]
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
         obj[gen-1] = 13.60 temp_best_value_gen = 13.60
49
50
         No, maintain solution and obj[gen] = 13.60, and the tolerance_counter = 2
51
         solution chromosome =
52
             first level: [ [ 2. 5.5 11.5 18. 22.5 26.5 2. ]
             second level: [0. 2. 1. 1. 2. 0. 3.]
53
54
            third level: [4. 3. 8. 3. 2. 4. 1.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 13.60 temp best value gen = 13.60
59
         No, maintain solution and obj[gen] = 13.60, and the tolerance_counter = 3
60
         solution chromosome =
61
             first level: [ [ 2. 5.5 11.5 18. 22.5 26.5 2. ]
             second level: [0. 2. 1. 1. 2. 0. 3.]
62
            third level: [4. 3. 8. 3. 2. 4. 1.]]
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 13.60 temp_best_value_gen = 13.60
68
         No, maintain solution and obj[gen] = 13.60, and the tolerance_counter = 4
69
         solution chromosome =
             first level: [ [ 2. 5.5 11.5 18. 22.5 26.5 2. ]
70
             second level: [0. 2. 1. 1. 2. 0. 3.]
71
            third level: [4. 3. 8. 3. 2. 4. 1.]]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obi[gen-1] = 13.60 temp best value gen = 11.60
76
         Yes, update solution and obj[gen] = 11.60
77
78
         solution chromosome =
             first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
```

```
second level: [0. 2. 0. 1. 2. 4. 1.]
 80
          third level: [4. 3. 4. 3. 2. 7. 4.]]
 81
 82
       The No. 5 iteration is finished!
 83
 84 Beging the No. 6 iteration:
 85
       obj[gen-1] = 11.60 temp best value gen = 11.60
       No, maintain solution and obj[gen] = 11.60, and the tolerance_counter = 1
 86
 87
        solution chromosome =
 88
          first level: [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
 89
          second level: [0. 2. 0. 1. 2. 4. 1.]
 90
          third level: [4. 3. 4. 3. 2. 7. 4.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
       obj[gen-1] = 11.60 temp_best_value_gen = 11.60
 95
       No, maintain solution and obj[gen] = 11.60, and the tolerance_counter = 2
 96
       solution chromosome =
 97
          first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
          second level: [0. 2. 0. 1. 2. 4. 1.]
 98
 99
          third level: [4. 3. 4. 3. 2. 7. 4.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 11.60 temp best value gen = 11.60
103
       No, maintain solution and obj[gen] = 11.60, and the tolerance_counter = 3
104
105
        solution chromosome =
          first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
106
          second level: [0. 2. 0. 1. 2. 4. 1.]
107
108
          third level: [4. 3. 4. 3. 2. 7. 4.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 11.60 temp_best_value_gen = 11.60
113
       No, maintain solution and obj[gen] = 11.60, and the tolerance_counter = 4
       solution chromosome =
114
          first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
115
116
          second level: [0. 2. 0. 1. 2. 4. 1.]
          third level: [4. 3. 4. 3. 2. 7. 4.]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 11.60 temp\_best\_value\_gen = 11.60
122
       No, maintain solution and obj[gen] = 11.60, and the tolerance_counter = 5
123
        solution chromosome =
124
          first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
          second level: [0. 2. 0. 1. 2. 4. 1.]
125
126
          third level: [4. 3. 4. 3. 2. 7. 4.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 11.60 temp_best_value_gen = 11.60
130
131
       No, maintain solution and obj[gen] = 11.60, and the tolerance_counter = 6
132
       solution chromosome =
          first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
133
134
          second level: [0. 2. 0. 1. 2. 4. 1.]
135
          third level: [4. 3. 4. 3. 2. 7. 4.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 11.60 temp_best_value_gen = 11.60
140
       No, maintain solution and obj[gen] = 11.60, and the tolerance_counter = 7
141
        solution chromosome =
142
          first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
          second level: [0. 2. 0. 1. 2. 4. 1.]
143
          third level: [4. 3. 4. 3. 2. 7. 4.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 11.60 temp_best_value_gen = 11.60
148
149
       No, maintain solution and obj[gen] = 11.60, and the tolerance_counter = 8
150
       solution chromosome =
          first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
151
152
          second level: [0. 2. 0. 1. 2. 4. 1.]
          third level: [4. 3. 4. 3. 2. 7. 4.]]
153
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 11.60 temp_best_value_gen = 11.60
158
       No, maintain solution and obj[gen] = 11.60, and the tolerance_counter = 9
159
        solution chromosome =
160
          first level: [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
          second level: [0. 2. 0. 1. 2. 4. 1.]
161
          third level: [4. 3. 4. 3. 2. 7. 4.]]
162
       The No. 14 iteration is finished!
163
```

```
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 11.60 temp_best_value_gen = 11.60
166
167
        No, maintain solution and obj[gen] = 11.60, and the tolerance_counter = 10
168
        solution chromosome =
          first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5] second level: [ 0. 2. 0. 1. 2. 4. 1.]
169
170
171
          third level: [4. 3. 4. 3. 2. 7. 4.]]
172
        The No. 15 iteration is finished!
173
174
175
176
     The iteration is terminated and then visulize the solution:
177
        solution chromosome =
          first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
178
179
          second level: [0. 2. 0. 1. 2. 4. 1.]
180
          third level: [4. 3. 4. 3. 2. 7. 4.]]
181
        Objective function values and some other indicators:
182
          Obj0 = 4.00
                                 Obj1 = 40.00
                                                        Obj0 + Obj1 = 44.00
183
           Total movement of crane: 30.00
          Total waiting time in berth position: 10.00
184
185
           Total index of q during berthing: 421.00
186
        Specific arrangement for each vessel:
           V_id: 0
187
                              li: 4.0
                                                   xi: 2.0
                                                                        bow of i: 0.0
                                                                                                   tail of i: 4.0
                                                                                                                             gama i0: 0.0
                                                                                                                                                         gama_i1: 2.0
                                                        demand_i: 100.0
                     duration\_time\_i{:}~2.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
188
           V_id: 1
                              li: 3.0
                                                   xi: 5.5
                                                                        bow of i: 4.0
                                                                                                    tail of i: 7.0
                                                                                                                             gama_i0: 2.0
                                                                                                                                                         gama_i1: 4.0
                                                        demand i: 80.0
                                                                                       work load i: 80.0
                     duration time i: 2.0
                                                                                                                        work load gap i: 0
           V_id: 2
                                                                                                      tail of i: 30.0
189
                                                                                                                                  gama_i0: 0.0
                              1i: 9.0
                                                   xi: 25.5
                                                                          bow of i: 21.0
                                                                                                                                                              gama_i1: 2
                                                                                          work load_i: 140.0
                       duration_time_i: 2.0
                                                           demand_i: 140.0
                                                                                                                           work load gap_i: 0
190
           V_id: 3
                              li: 4.0
                                                                          bow of i: 16.0
                                                                                                      tail of i: 20.0
                                                                                                                                  gama_i0: 1.0
                                                                                                                                                              gama_i1: 4
     .0
                       duration time i: 3.0
                                                           demand i: 140.0
                                                                                         work load_i: 140.0
                                                                                                                           work load gap_i: 0
191
                                                                                                                                  gama_i0: 2.0
           V_id: 4
                                                   xi: 22.5
                                                                          bow of i: 20.0
                              li: 5.0
                                                                                                      tail of i: 25.0
                                                                                                                                                              gama_i1: 4
     .0
                       duration\_time\_i{:}~2.0
                                                           demand_i: 80.0
                                                                                          work load_i: 80.0
                                                                                                                           work load gap_i: 0
192
           V_id: 5
                                                   xi: 4.5
                                                                                                   tail of i: 8.0
                                                                                                                             gama_i0: 4.0
                                                                                                                                                         gama_i1: 5.0
                               1i: 7.0
                                                                        bow of i: 1.0
                     duration_time_i: 1.0
                                                        demand i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                        work load gap_i: 0
193
                                                                          bow of i: 9.5
                                                                                                      tail of i: 13.5
           V_id: 6
                                                                                                                                  gama_i0: 1.0
                                                                                                                                                              gama_i1: 2
                              li: 4.0
                                                   xi: 11.5
     .0
                       duration_time_i: 1.0
                                                           demand_i: 60.0
                                                                                          work load_i: 60.0
                                                                                                                           work load gap_i: 0
194
195
     Algorithm finished and the total CPU time: 1251 s
196 End
197
```