```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=54867
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   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_9 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
       Mutation rate = 0.95
27
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 2
30
       coefficient for Obj1= 1.9
       coefficient for Obj2= 0.100000000000000009
31
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 22.80 temp_best_value_gen = 22.80
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 22.80 temp_best_value_gen = 22.80
40
     No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
44
       second level: [1. 6. 7. 0. 2. 5. 3.]
       third level: [7. 7. 2. 2. 2. 2. 6.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
obj[gen-1] = 22.80 temp_best_value_gen = 22.80
49
50
     No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 2
51
     solution chromosome =
       first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
52
53
       second level: [1. 6. 7. 0. 2. 5. 3.]
54
       third level: [7. 7. 2. 2. 2. 2. 6.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 22.80 temp best value gen = 22.80
59
     No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
62
       second level: [1. 6. 7. 0. 2. 5. 3.]
       third level: [7. 7. 2. 2. 2. 2. 6.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 22.80 temp\_best\_value\_gen = 22.80
68
     No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 4
69
     solution chromosome =
70
       first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
       second level: [1. 6. 7. 0. 2. 5. 3.]
71
       third level: [7. 7. 2. 2. 2. 2. 6.]]
73
     The No. 4 iteration is finished!
74
75
  Beging the No. 5 iteration:
     obi[gen-1] = 22.80 temp best value gen = 22.80
76
     No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 5
77
78
     solution chromosome =
        first level: [[4. 11.5 18. 22.5 27. 26.5 4.]
```

```
second level: [1. 6. 7. 0. 2. 5. 3.]
 80
          third level: [7. 7. 2. 2. 2. 2. 6.]]
 81
 82
       The No. 5 iteration is finished!
 83
 84 Beging the No. 6 iteration:
       obj[gen-1] = 22.80 temp_best_value_gen = 22.80
No, maintain solution_and obj[gen] = 22.80, and the tolerance_counter = 6
 85
 86
 87
        solution chromosome =
 88
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
          second level: [1. 6. 7. 0. 2. 5. 3.]
 89
 90
          third level: [7. 7. 2. 2. 2. 2. 6.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
       obj[gen-1] = 22.80 temp\_best\_value\_gen = 22.80
 95
       No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 7
 96
       solution chromosome =
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
 97
 98
          second level: [1. 6. 7. 0. 2. 5. 3.]
 99
          third level: [7. 7. 2. 2. 2. 2. 6.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 22.80 temp best value gen = 22.80
103
104
       No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
106
          second level: [1. 6. 7. 0. 2. 5. 3.]
107
108
          third level: [7. 7. 2. 2. 2. 2. 6.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 22.80 temp_best_value_gen = 22.80
113
       No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 9
       solution chromosome =
114
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
115
116
          second level: [1. 6. 7. 0. 2. 5. 3.]
          third level: [7. 7. 2. 2. 2. 2. 6.]]
117
       The No. 9 iteration is finished!
118
119
120 Beging the No. 10 iteration:
       obj[gen-1] = 22.80 temp_best_value_gen = 16.70
121
122
        Yes, update solution and obj[gen] = 16.70
123
       solution chromosome =
124
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
          second level: [1. 6. 3. 0. 2. 5. 3.]
125
126
          third level: [7. 7. 2. 2. 2. 2. 6.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 16.70 temp_best_value_gen = 16.70
130
131
       No, maintain solution and obj[gen] = 16.70, and the tolerance_counter = 1
132
       solution chromosome =
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
133
134
          second level: [1. 6. 3. 0. 2. 5. 3.]
135
          third level: [7. 7. 2. 2. 2. 2. 6.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 16.70 temp_best_value_gen = 16.70
140
       No, maintain solution and obj[gen] = 16.70, and the tolerance_counter = 2
141
        solution chromosome =
142
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
143
          second level: [1. 6. 3. 0. 2. 5. 3.]
          third level: [7. 7. 2. 2. 2. 2. 6.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 16.70 temp_best_value_gen = 16.70
149
       No, maintain solution and obj[gen] = 16.70, and the tolerance_counter = 3
150
       solution chromosome =
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
151
152
          second level: [1. 6. 3. 0. 2. 5. 3.]
153
          third level: [7. 7. 2. 2. 2. 2. 6.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 16.70 temp_best_value_gen = 16.70
       No, maintain solution and obj[gen] = 16.70, and the tolerance_counter = 4
158
159
        solution chromosome =
160
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
          second level: [1. 6. 3. 0. 2. 5. 3.]
161
          third level: [7. 7. 2. 2. 2. 2. 6.]]
162
       The No. 14 iteration is finished!
163
```

```
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 16.70 temp_best_value_gen = 16.70
166
167
        No, maintain solution and obj[gen] = 16.70, and the tolerance_counter = 5
168
        solution chromosome =
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
169
          second level: [1. 6. 3. 0. 2. 5. 3.]
170
171
          third level: [7. 7. 2. 2. 2. 2. 6.]]
172
        The No. 15 iteration is finished!
173
     Beging the No. 16 iteration:
174
175
        obj[gen-1] = 16.70 temp_best_value_gen = 16.70
        No, maintain solution and obj[gen] = 16.70, and the tolerance_counter = 6
176
177
        solution chromosome =
178
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
179
          second level: [1. 6. 3. 0. 2. 5. 3.]
          third level: [7. 7. 2. 2. 2. 2. 6.]]
180
181
        The No. 16 iteration is finished!
182
183
184
185 The iteration is terminated and then visulize the solution:
186
        solution chromosome =
          first level: [ [ 4. 11.5 18. 22.5 27. 26.5 4. ]
187
188
          second level: [1. 6. 3. 0. 2. 5. 3.]
189
          third level: [7. 7. 2. 2. 2. 2. 6.]]
190
        Objective function values and some other indicators:
                                Obj1 = 34.00
                                                       Obj0 + Obj1 = 41.00
191
          Obio = 7.00
192
          Total movement of crane: 14.00
193
          Total waiting time in berth position: 20.00
194
          Total index of q during berthing: 587.00
195
        Specific arrangement for each vessel:
196
           V_id: 0
                              li: 8.0
                                                  xi: 4.0
                                                                       bow of i: 0.0
                                                                                                  tail of i: 8.0
                                                                                                                           gama_i0: 1.0
                                                                                                                                                       gama_i1: 2.0
                    duration_time_i: 1.0
                                                       demand_i: 120.0
                                                                                      work load_i: 120.0
                                                                                                                      work load gap_i: 0
                                                                                                    tail of i: 15.0
197
          V_id: 1
                              li: 7.0
                                                  xi: 11.5
                                                                         bow of i: 8.0
                                                                                                                                gama i0: 6.0
                                                                                                                                                            gama_i1: 8
                                                          demand_i: 160.0
     .0
                       duration_time_i: 2.0
                                                                                        work load_i: 160.0
                                                                                                                         work load gap_i: 0
198
           V_id: 2
                              li: 6.0
                                                  xi: 18.0
                                                                         bow of i: 15.0
                                                                                                    tail of i: 21.0
                                                                                                                                gama_i0: 3.0
                                                                                                                                                            gama_i1: 7
                       duration time i: 4.0
                                                          demand i: 140.0
                                                                                        work load i: 140.0
                                                                                                                         work load gap_i: 0
     .0
199
                                                                                                                                gama_i0: 0.0
           V_id: 3
                                                  xi: 22.5
                                                                         bow of i: 21.0
                                                                                                    tail of i: 24.0
                              li: 3.0
                                                                                                                                                            gama_i1: 3
     .0
                       duration\_time\_i{:}~3.0
                                                          demand_i: 100.0
                                                                                        work load_i: 100.0
                                                                                                                         work load gap_i: 0
200
           V_id: 4
                              li: 6.0
                                                  xi: 27.0
                                                                         bow of i: 24.0
                                                                                                    tail of i: 30.0
                                                                                                                                gama_i0: 2.0
                                                                                                                                                            gama_i1: 5
                                                          demand i: 120.0
                                                                                        work load i: 120.0
                                                                                                                         work load gap_i: 0
     .0
                       duration time i: 3.0
201
           V_id: 5
                                                  xi: 26.5
                                                                                                    tail of i: 30.0
                                                                         bow of i: 23.0
                                                                                                                                gama_i0: 5.0
                                                                                                                                                            gama_i1: 8
                              1i: 7.0
                                                          demand_i: 120.0
     .0
                       duration_time_i: 3.0
                                                                                        work load_i: 120.0
                                                                                                                         work load gap_i: 0
202
                                                                      bow of i: 0.0
                                                                                                                           gama_i0: 3.0
                                                                                                                                                       gama_i1: 5.0
           V_id: 6
                              li: 8.0
                                                                                                  tail of i: 8.0
                                                       demand_i: 140.0
                    duration_time_i: 2.0
                                                                                      work load_i: 140.0
                                                                                                                      work load gap_i: 0
203
204 Algorithm finished and the total CPU time: 1252 s
205 End
206
```