```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=10044
2
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   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_6_3 _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 = 58
21
       Pop\_size = 30
       Tolerance iteration unchanged number = 10
23
       Chrom\_size = 18
       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] = 19.64 temp_best_value_gen = 19.64
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 19.64 temp_best_value_gen = 16.41
40
     Yes, update solution and obj[gen] = 16.41
41
     solution chromosome =
42
43
       first level: [ [7.23 1.65 6.55 4.51 4.48 6.78]
44
       second level: [3. 1. 4. 0. 6. 1.]
       third level: [7. 3. 4. 6. 3. 5.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 16.41 temp_best_value_gen = 16.41
49
50
     No, maintain solution and obj[gen] = 16.41, and the tolerance_counter = 1
51
     solution chromosome =
52
       first level: [ [7.23 1.65 6.55 4.51 4.48 6.78]
53
       second level: [3. 1. 4. 0. 6. 1.]
54
       third level: [7. 3. 4. 6. 3. 5.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 16.41 temp best value gen = 15.90
     Yes, update solution and obj[gen] = 15.90
59
60
     solution chromosome =
       first level: [ [26. 9.5 15. 22.5 4. 2.5]
61
62
       second level: [6. 1. 4. 0. 0. 3.]
63
       third level: [3. 3. 4. 6. 2. 5.]]
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 15.90 temp_best_value_gen = 15.90
68
     No, maintain solution and obj[gen] = 15.90, and the tolerance_counter = 1
69
     solution chromosome =
       first level: [ [26. 9.5 15. 22.5 4. 2.5]
70
71
       second level: [6. 1. 4. 0. 0. 3.]
       third level: [3. 3. 4. 6. 2. 5.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 15.90 temp best value gen = 15.00
76
     Yes, update solution and obj[gen] = 15.00
77
78
     solution chromosome =
       first level: [ [26. 9.5 15. 3.5 4. 22.5]
```

```
second level: [0. 3. 1. 3. 0. 5.]
 80
 81
          third level: [6. 3. 2. 5. 2. 4.]]
 82
       The No. 5 iteration is finished!
 83
 84 Beging the No. 6 iteration:
 85
       obj[gen-1] = 15.00 temp best value gen = 15.00
       No, maintain solution and obj[gen] = 15.00, and the tolerance_counter = 1
 86
 87
       solution chromosome =
 88
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
 89
          second level: [0. 3. 1. 3. 0. 5.]
 90
          third level: [6. 3. 2. 5. 2. 4.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
       obj[gen-1] = 15.00 temp_best_value_gen = 15.00
 94
 95
       No, maintain solution and obj[gen] = 15.00, and the tolerance_counter = 2
 96
       solution chromosome =
 97
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
 98
          second level: [0. 3. 1. 3. 0. 5.]
 99
          third level: [6. 3. 2. 5. 2. 4.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 15.00 temp best value gen = 15.00
103
104
       No, maintain solution and obj[gen] = 15.00, and the tolerance_counter = 3
105
       solution chromosome =
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
106
          second level: [0. 3. 1. 3. 0. 5.]
107
108
          third level: [6. 3. 2. 5. 2. 4.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
       obj[gen-1] = 15.00 temp\_best\_value\_gen = 15.00
113
       No, maintain solution and obj[gen] = 15.00, and the tolerance_counter = 4
       solution chromosome =
114
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
115
116
          second level: [0. 3. 1. 3. 0. 5.]
          third level: [6. 3. 2. 5. 2. 4.]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
       obj[gen-1] = 15.00 temp_best_value_gen = 15.00
121
122
       No, maintain solution and obj[gen] = 15.00, and the tolerance_counter = 5
123
       solution chromosome =
124
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
125
          second level: [0. 3. 1. 3. 0. 5.]
126
          third level: [6. 3. 2. 5. 2. 4.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
       obj[gen-1] = 15.00 temp_best_value_gen = 15.00
130
131
       No, maintain solution and obj[gen] = 15.00, and the tolerance_counter = 6
132
       solution chromosome =
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
133
134
          second level: [0. 3. 1. 3. 0. 5.]
135
          third level: [6. 3. 2. 5. 2. 4.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 15.00 temp_best_value_gen = 15.00
140
       No, maintain solution and obj[gen] = 15.00, and the tolerance_counter = 7
141
       solution chromosome =
142
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
          second level: [0. 3. 1. 3. 0. 5.]
143
          third level: [6. 3. 2. 5. 2. 4.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
       obj[gen-1] = 15.00 temp_best_value_gen = 15.00
149
       No, maintain solution and obj[gen] = 15.00, and the tolerance_counter = 8
150
       solution chromosome =
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
151
152
          second level: [0. 3. 1. 3. 0. 5.]
153
          third level: [6. 3. 2. 5. 2. 4.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 15.00 temp_best_value_gen = 15.00
158
       No, maintain solution and obj[gen] = 15.00, and the tolerance_counter = 9
159
       solution chromosome =
160
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
          second level: [0. 3. 1. 3. 0. 5.]
161
          third level: [6. 3. 2. 5. 2. 4.]]
162
       The No. 14 iteration is finished!
163
```

```
164
165 Beging the No. 15 iteration:
       obj[gen-1] = 15.00 temp_best_value_gen = 15.00
166
       No, maintain solution and obj[gen] = 15.00, and the tolerance_counter = 10
167
168
       solution chromosome =
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
169
          second level: [0. 3. 1. 3. 0. 5.]
170
171
          third level: [6. 3. 2. 5. 2. 4.]]
172
        The No. 15 iteration is finished!
173
174
175
176
    The iteration is terminated and then visulize the solution:
177
       solution chromosome =
178
          first level: [ [26. 9.5 15. 3.5 4. 22.5]
179
          second level: [0. 3. 1. 3. 0. 5.]
180
          third level: [6. 3. 2. 5. 2. 4.]]
181
       Objective function values and some other indicators:
                                                      Obj0 + Obj1 = 42.00
182
          Obj0 = 6.00
                                Obj1 = 36.00
183
          Total movement of crane: 24.00
          Total waiting time in berth position: 12.00
184
185
          Total index of q during berthing: 344.00
186
        Specific arrangement for each vessel:
          V_id: 0
187
                              li: 8.0
                                                  xi: 26.0
                                                                        bow of i: 22.0
                                                                                                   tail of i: 30.0
                                                                                                                              gama i0: 0.0
                                                                                                                                                          gama_i1: 1
                                                         demand_i: 80.0
                                                                                       work load_i: 80.0
                                                                                                                       work load gap_i: 0
     .0
                      duration\_time\_i{:}~1.0
188
                                                  xi: 9.5
          V_id: 1
                              li: 3.0
                                                                      bow of i: 8.0
                                                                                                 tail of i: 11.0
                                                                                                                            gama_i0: 3.0
                                                                                                                                                        gama_i1: 5.0
                    duration time i: 2.0
                                                      demand_i: 100.0
                                                                                     work load i: 100.0
                                                                                                                     work load gap i: 0
                                                                        bow of i: 11.0
                                                                                                                               gama_i0: 1.0
          V_id: 2
189
                                                                                                   tail of i: 19.0
                              1i: 8.0
                                                  xi: 15.0
                                                                                                                                                          gama_i1: 3
                                                                                                                        work load gap_i: 0
                       duration_time_i: 2.0
                                                                                       work load_i: 80.0
                                                         demand_i: 80.0
190
          V_id: 3
                              1i: 7.0
                                                  xi: 3.5
                                                                      bow of i: 0.0
                                                                                                 tail of i: 7.0
                                                                                                                          gama_i0: 3.0
                                                                                                                                                     gama_i1: 4.0
                    duration_time_i: 1.0
                                                      demand_i: 80.0
                                                                                     work load i: 80.0
                                                                                                                     work load gap i: 0
191
          V id: 4
                                                                      bow of i: 0.0
                                                                                                 tail of i: 8.0
                                                                                                                                                     gama_i1: 3.0
                                                  xi: 4.0
                                                                                                                          gama_i0: 0.0
                              li: 8.0
                    duration_time_i: 3.0
                                                      demand_i: 100.0
                                                                                     work load_i: 100.0
                                                                                                                     work load gap_i: 0
192
          V_id: 5
                              1i: 5.0
                                                  xi: 22.5
                                                                        bow of i: 20.0
                                                                                                   tail of i: 25.0
                                                                                                                               gama_i0: 5.0
                                                                                                                                                          gama_i1: 7
     .0
                       duration_time_i: 2.0
                                                         demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                       work load gap_i: 0
193
194 Algorithm finished and the total CPU time: 1082 s
195 End
196
```