```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=50610
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_6 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 = 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] = 16.40 temp_best_value_gen = 16.40
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 16.40 temp_best_value_gen = 16.00
40
     Yes, update solution and obj[gen] = 16.00
41
     solution chromosome =
42
43
       first level: [ [ 4. 10.5 26. 23.5 17. 4. ]
       second level: [1. 2. 3. 5. 4. 0.]
44
45
       third level: [8. 4. 6. 3. 6. 6.]]
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 16.00 temp_best_value_gen = 16.00
49
50
     No, maintain solution and obj[gen] = 16.00, and the tolerance_counter = 1
51
     solution chromosome =
52
       first level: [ [ 4. 10.5 26. 23.5 17. 4. ]
       second level: [1. 2. 3. 5. 4. 0.]
53
54
       third level: [8. 4. 6. 3. 6. 6.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 16.00 temp best value gen = 16.00
59
     No, maintain solution and obj[gen] = 16.00, and the tolerance_counter = 2
60
     solution chromosome =
61
       first level: [ [ 4. 10.5 26. 23.5 17. 4. ]
62
       second level: [1. 2. 3. 5. 4. 0.]
       third level: [8. 4. 6. 3. 6. 6.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 16.00 temp_best_value_gen = 12.80
68
     Yes, update solution and obj[gen] = 12.80
69
     solution chromosome =
       first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
70
       second level: [2. 3. 0. 3. 0. 1.]
71
       third level: [5. 2. 6. 3. 6. 5.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 12.80 temp best value gen = 12.80
76
     No, maintain solution and obj[gen] = \overline{12.80}, and the tolerance_counter = 1
77
78
     solution chromosome =
       first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
```

```
second level: [2. 3. 0. 3. 0. 1.]
 80
 81
          third level: [5. 2. 6. 3. 6. 5.]]
 82
       The No. 5 iteration is finished!
 83
 84 Beging the No. 6 iteration:
 85
       obj[gen-1] = 12.80 temp best value gen = 12.80
       No, maintain solution and obj[gen] = 12.80, and the tolerance_counter = 2
 86
 87
        solution chromosome =
 88
          first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
          second level: [2. 3. 0. 3. 0. 1.]
 89
 90
          third level: [5. 2. 6. 3. 6. 5.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 12.80 temp\_best\_value\_gen = 12.80
 95
       No, maintain solution and obj[gen] = 12.80, and the tolerance_counter = 3
 96
       solution chromosome =
 97
          first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
 98
          second level: [2. 3. 0. 3. 0. 1.]
 99
          third level: [5. 2. 6. 3. 6. 5.]]
       The No. 7 iteration is finished!
100
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 12.80 temp best value gen = 12.80
103
104
       No, maintain solution and obj[gen] = 12.80, and the tolerance_counter = 4
105
        solution chromosome =
          first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
106
107
          second level: [2. 3. 0. 3. 0. 1.]
108
          third level: [5. 2. 6. 3. 6. 5.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 12.80 temp_best_value_gen = 12.80
113
       No, maintain solution and obj[gen] = 12.80, and the tolerance_counter = 5
       solution chromosome =
114
          first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
115
116
          second level: [2. 3. 0. 3. 0. 1.]
          third level: [5. 2. 6. 3. 6. 5.]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 12.80 temp\_best\_value\_gen = 12.80
122
       No, maintain solution and obj[gen] = 12.80, and the tolerance_counter = 6
123
        solution chromosome =
124
          first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
          second level: [2. 3. 0. 3. 0. 1.]
125
126
          third level: [5. 2. 6. 3. 6. 5.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 12.80 temp_best_value_gen = 12.80
130
131
       No, maintain solution and obj[gen] = 12.80, and the tolerance_counter = 7
132
       solution chromosome =
          first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
133
134
          second level: [2. 3. 0. 3. 0. 1.]
135
          third level: [5. 2. 6. 3. 6. 5.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 12.80 temp_best_value_gen = 12.80
140
       No, maintain solution and obj[gen] = 12.80, and the tolerance_counter = 8
141
        solution chromosome =
142
          first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
143
          second level: [2. 3. 0. 3. 0. 1.]
          third level: [5. 2. 6. 3. 6. 5.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 12.80 temp_best_value_gen = 12.80
148
149
       No, maintain solution and obj[gen] = 12.80, and the tolerance_counter = 9
150
       solution chromosome =
          first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
151
152
          second level: [2. 3. 0. 3. 0. 1.]
153
          third level: [5. 2. 6. 3. 6. 5.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 12.80 temp_best_value_gen = 12.80
158
       No, maintain solution and obj[gen] = 12.80, and the tolerance_counter = 10
159
        solution chromosome =
160
          first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
          second level: [2. 3. 0. 3. 0. 1.]
161
          third level: [5. 2. 6. 3. 6. 5.]]
162
       The No. 14 iteration is finished!
163
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```
164
165
166
167
     The iteration is terminated and then visulize the solution:
168
        solution chromosome =
          first level: [ [ 4. 10.5 4. 23.5 17. 26. ]
169
          second level: [2. 3. 0. 3. 0. 1.]
170
171
          third level: [5. 2. 6. 3. 6. 5.]]
172
        Objective function values and some other indicators:
                                Obj1 = 33.00
173
          Obj0 = 5.00
                                                       Obj0 + Obj1 = 38.00
174
          Total movement of crane: 24.00
175
           Total waiting time in berth position: 9.00
176
          Total index of q during berthing: 366.00
177
        Specific arrangement for each vessel:
178
           V_id: 0
                              li: 8.0
                                                  xi: 4.0
                                                                      bow of i: 0.0
                                                                                                  tail of i: 8.0
                                                                                                                           gama_i0: 2.0
                                                                                                                                                      gama_i1: 3.0
                    duration_time_i: 1.0
                                                       demand_i: 100.0
                                                                                     work load_i: 100.0
                                                                                                                      work load gap_i: 0
179
          V\_id{:}\ 1
                                                                         bow of i: 8.0
                                                                                                    tail of i: 13.0
                                                                                                                                gama_i0: 3.0
                                                                                                                                                           gama_i1: 5
                              1i: 5.0
                                                  xi: 10.5
                                                                                        work load_i: 60.0
                       duration_time_i: 2.0
                                                          demand_i: 60.0
                                                                                                                        work load gap_i: 0
     .0
180
           V_id: 2
                              1i: 8.0
                                                  xi: 4.0
                                                                      bow of i: 0.0
                                                                                                  tail of i: 8.0
                                                                                                                          gama_i0: 0.0
                                                                                                                                                      gama_i1: 1.0
                                                                                                                      work load gap_i: 0
                    duration time i: 1.0
                                                       demand i: 60.0
                                                                                     work load i: 60.0
181
           V_id: 3
                              li: 5.0
                                                                                                    tail of i: 26.0
                                                                                                                               gama_i0: 3.0
                                                                                                                                                           gama_i1: 6
                                                  xi: 23.5
                                                                         bow of i: 21.0
                       duration\_time\_i{:}~3.0
                                                          demand_i: 140.0
                                                                                        work load_i: 140.0
                                                                                                                        work load gap_i: 0
     .0
182
           V_id: 4
                              li: 6.0
                                                  xi: 17.0
                                                                         bow of i: 14.0
                                                                                                    tail of i: 20.0
                                                                                                                                gama_i0: 0.0
                                                                                                                                                           gama_i1: 1
     .0
                       duration time i: 1.0
                                                          demand_i: 120.0
                                                                                        work load_i: 120.0
                                                                                                                        work load gap i: 0
183
                                                                        bow of i: 22.0
           V_id: 5
                              1i: 8.0
                                                  xi: 26.0
                                                                                                    tail of i: 30.0
                                                                                                                                gama_i0: 1.0
                                                                                                                                                           gama_i1: 2
                                                          demand_i: 80.0
     .0
                       duration_time_i: 1.0
                                                                                        work load_i: 80.0
                                                                                                                        work load gap_i: 0
185 Algorithm finished and the total CPU time: 1025 s
186 End
187
```