```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=51065
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_8 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] = 19.70 temp_best_value_gen = 19.70
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 19.70 temp_best_value_gen = 19.20
40
     Yes, update solution and obj[gen] = 19.20
41
     solution chromosome =
42
43
       first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
       second level: [4. 1. 0. 6. 3. 1.]
44
45
       third level: [2. 3. 2. 5. 3. 3.]]
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 19.20 temp_best_value_gen = 19.20
49
50
     No, maintain solution and obj[gen] = 19.20, and the tolerance_counter = 1
51
     solution chromosome =
       first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
52
53
       second level: [4. 1. 0. 6. 3. 1.]
54
       third level: [2. 3. 2. 5. 3. 3.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 19.20 temp best value gen = 19.20
59
     No, maintain solution and obj[gen] = 19.20, and the tolerance_counter = 2
60
     solution chromosome =
61
       first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
62
       second level: [4. 1. 0. 6. 3. 1.]
       third level: [2. 3. 2. 5. 3. 3.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 19.20 temp_best_value_gen = 19.00
68
     Yes, update solution and obj[gen] = 19.00
69
     solution chromosome =
70
       first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
       second level: [0. 3. 0. 6. 3. 1.]
71
       third level: [3. 3. 2. 5. 3. 3.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 19.00 temp best value gen = 19.00
76
     No, maintain solution and obj[gen] = 19.00, and the tolerance_counter = 1
77
78
     solution chromosome =
       first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
```

```
second level: [0. 3. 0. 6. 3. 1.]
 80
 81
          third level: [3. 3. 2. 5. 3. 3.]]
 82
       The No. 5 iteration is finished!
 83
 84 Beging the No. 6 iteration:
 85
       obj[gen-1] = 19.00 temp best value gen = 19.00
       No, maintain solution and obj[gen] = 19.00, and the tolerance_counter = 2
 86
 87
        solution chromosome =
 88
          first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
          second level: [0. 3. 0. 6. 3. 1.]
 89
 90
          third level: [3. 3. 2. 5. 3. 3.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 19.00 temp_best_value_gen = 18.60
 94
 95
        Yes, update solution and obj[gen] = 18.60
 96
       solution chromosome =
          first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
 97
 98
          second level: [0. 3. 0. 6. 1. 3.]
 99
          third level: [3. 3. 2. 5. 3. 3.]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 18.60 temp best value gen = 18.60
103
104
       No, maintain solution and obj[gen] = 18.60, and the tolerance_counter = 1
105
        solution chromosome =
          first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
106
          second level: [0. 3. 0. 6. 1. 3.]
107
108
          third level: [3. 3. 2. 5. 3. 3.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 18.60 temp_best_value_gen = 18.60
113
       No, maintain solution and obj[gen] = 18.60, and the tolerance_counter = 2
       solution chromosome =
114
          first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
115
116
          second level: [0. 3. 0. 6. 1. 3.]
          third level: [3. 3. 2. 5. 3. 3.]
117
       The No. 9 iteration is finished!
118
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 18.60 temp\_best\_value\_gen = 18.60
122
       No, maintain solution and obj[gen] = 18.60, and the tolerance_counter = 3
123
        solution chromosome =
124
          first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
125
          second level: [0. 3. 0. 6. 1. 3.]
126
          third level: [3. 3. 2. 5. 3. 3.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 18.60 temp_best_value_gen = 18.60
130
131
       No, maintain solution and obj[gen] = 18.60, and the tolerance_counter = 4
132
       solution chromosome =
          first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
133
134
          second level: [0. 3. 0. 6. 1. 3.]
135
          third level: [3. 3. 2. 5. 3. 3.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 18.60 temp_best_value_gen = 18.60
140
       No, maintain solution and obj[gen] = 18.60, and the tolerance_counter = 5
141
        solution chromosome =
142
          first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
143
          second level: [0. 3. 0. 6. 1. 3.]
          third level: [3. 3. 2. 5. 3. 3.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 18.60 temp_best_value_gen = 18.60
148
149
       No, maintain solution and obj[gen] = 18.60, and the tolerance_counter = 6
150
       solution chromosome =
151
          first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
152
          second level: [0. 3. 0. 6. 1. 3.]
153
          third level: [3. 3. 2. 5. 3. 3.]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 18.60 temp_best_value_gen = 18.60
       No, maintain solution and obj[gen] = 18.60, and the tolerance_counter = 7
158
159
        solution chromosome =
160
          first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
          second level: [0. 3. 0. 6. 1. 3.]
161
162
          third level: [3. 3. 2. 5. 3. 3.]]
       The No. 14 iteration is finished!
163
```

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unknown
164
165 Beging the No. 15 iteration:
         obj[gen-1] = 18.60 temp_best_value_gen = 18.60
166
167
        No, maintain solution and obj[gen] = 18.60, and the tolerance_counter = 8
168
        solution chromosome =
           first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
169
           second level: [0. 3. 0. 6. 1. 3.]
170
171
           third level: [3. 3. 2. 5. 3. 3.]]
172
         The No. 15 iteration is finished!
173
174
      Beging the No. 16 iteration:
175
        obj[gen-1] = 18.60 temp_best_value_gen = 18.60
        No, maintain solution and obj[gen] = 18.60, and the tolerance_counter = 9
176
177
        solution chromosome =
178
           first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
179
           second level: [0. 3. 0. 6. 1. 3.]
180
           third level: [3. 3. 2. 5. 3. 3.]
181
         The No. 16 iteration is finished!
182
183
      Beging the No. 17 iteration:
        obj[gen-1] = 18.60 temp_best_value_gen = 18.60
184
185
        No, maintain solution and obj[gen] = 18.60, and the tolerance_counter = 10
186
         solution chromosome =
           first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
187
188
           second level: [0. 3. 0. 6. 1. 3.]
           third level: [3. 3. 2. 5. 3. 3.]]
189
190
         The No. 17 iteration is finished!
191
192
193
194
     The iteration is terminated and then visulize the solution:
195
        solution chromosome =
196
           first level: [ [ 4.5 10.5 15.5 22.5 27.5 27.5]
197
           second level: [0. 3. 0. 6. 1. 3.]
198
           third level: [3. 3. 2. 5. 3. 3.]]
199
         Objective function values and some other indicators:
200
           Obj0 = 7.00
                                 Obj1 = 53.00
                                                        Obj0 + Obj1 = 60.00
           Total movement of crane: 40.00
201
           Total waiting time in berth position: 13.00
202
203
           Total index of q during berthing: 515.00
204
         Specific arrangement for each vessel:
205
           V_id: 0
                               li: 9.0
                                                   xi: 4.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                            gama i0: 0.0
                                                                                                                                                        gama_i1: 3.0
                                                        demand\_i{:}\ 160.0
                     duration_time_i: 3.0
                                                                                      work load i: 160.0
                                                                                                                       work load gap_i: 0
                                                                          bow of i: 9.0
206
           V_id: 1
                               li: 3.0
                                                   xi: 10.5
                                                                                                      tail of i: 12.0
                                                                                                                                 gama_i0: 3.0
                                                                                                                                                             gama_i1: 6
      .0
                        duration_time_i: 3.0
                                                           demand_i: 160.0
                                                                                         work load_i: 160.0
                                                                                                                          work load gap_i: 0
                                                                                                                                 gama_i0: 0.0
207
           V_id: 2
                               1i: 7.0
                                                   xi: 15.5
                                                                          bow of i: 12.0
                                                                                                     tail of i: 19.0
                                                                                                                                                             gama_i1: 2
                                                           demand\_i{:}~60.0
      .0
                        duration_time_i: 2.0
                                                                                         work load_i: 60.0
                                                                                                                          work load gap_i: 0
208
           V_id: 3
                               li: 7.0
                                                                          bow of i: 19.0
                                                                                                      tail of i: 26.0
                                                                                                                                 gama_i0: 6.0
                                                                                                                                                             gama_i1: 8
                        duration time i: 2.0
                                                                                         work load i: 160.0
                                                                                                                          work load gap_i: 0
      .0
                                                           demand_i: 160.0
209
                                                                          bow of i: 26.0
                                                                                                     tail of i: 29.0
           V_id: 4
                               1i: 3.0
                                                   xi: 27.5
                                                                                                                                 gama_i0: 1.0
                                                                                                                                                             gama_i1: 3
                        duration_time_i: 2.0
                                                           demand i: 120.0
                                                                                         work load i: 120.0
                                                                                                                          work load gap_i: 0
210
           V_id: 5
                               li: 5.0
                                                                          bow of i: 25.0
                                                                                                     tail of i: 30.0
                                                                                                                                 gama_i0: 3.0
                                                                                                                                                             gama_i1: 5
                                                           demand i: 100.0
                                                                                         work load i: 100.0
                                                                                                                          work load gap_i: 0
      .0
                        duration_time_i: 2.0
211
212 Algorithm finished and the total CPU time: 1231 s
213 End
214
```