```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=12787
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_4_5 _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 = 12
       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] = 12.30 temp_best_value_gen = 12.30
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 12.30 temp_best_value_gen = 12.30
40
     No, maintain solution and obj[gen] = 12.30, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 4.5 12.5 18. 22. ]
       second level: [5. 3. 1. 0.]
44
       third level: [6. 5. 4. 2.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 12.30 temp_best_value_gen = 10.40
49
50
     Yes, update solution and obj[gen] = 10.40
51
     solution chromosome =
52
       first level: [ [12.5 4.5 18. 22. ]
53
       second level: [3. 5. 1. 0.]
54
       third level: [5. 6. 4. 2.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 10.40 temp best value gen = 10.40
59
     No, maintain solution and obj[gen] = 10.40, and the tolerance_counter = 1
60
     solution chromosome =
61
       first level: [ [12.5 4.5 18. 22. ]
62
       second level: [3. 5. 1. 0.]
       third level: [5. 6. 4. 2.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 10.40 temp_best_value_gen = 10.00
68
     Yes, update solution and obj[gen] = 10.00
69
     solution chromosome =
70
       first level: [ [12.5 4.5 22. 18. ]
71
       second level: [3. 1. 0. 1.]
       third level: [3. 5. 2. 4.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 10.00 temp best value gen = 8.10
76
     Yes, update solution and obj[gen] = 8.10
77
     solution chromosome =
78
       first level: [ [ 4.5 12.5 18. 22. ]
```

```
second level: [1. 3. 1. 0.]
 80
 81
          third level: [6. 5. 4. 2.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 8.10 temp best value gen = 8.10
 86
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 1
 87
        solution chromosome =
 88
          first level: [ [ 4.5 12.5 18. 22. ]
          second level: [1. 3. 1. 0.]
 89
 90
          third level: [6. 5. 4. 2.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 8.10 temp_best_value_gen = 8.10
 95
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 2
 96
       solution chromosome =
 97
          first level: [ [ 4.5 12.5 18. 22. ]
 98
          second level: [1. 3. 1. 0.]
 99
          third level: [6. 5. 4. 2.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 8.10 temp best value gen = 8.10
103
104
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 3
105
        solution chromosome =
          first level: [ [ 4.5 12.5 18. 22. ]
106
          second level: [1. 3. 1. 0.]
107
108
          third level: [6. 5. 4. 2.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 8.10 temp_best_value_gen = 8.10
113
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 4
       solution chromosome =
114
          first level: [ [ 4.5 12.5 18. 22. ]
115
116
          second level: [1. 3. 1. 0.]
          third level: [6. 5. 4. 2.]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 8.10 \quad temp\_best\_value\_gen = 8.10
122
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 5
123
        solution chromosome =
124
          first level: [ [ 4.5 12.5 18. 22. ]
          second level: [1. 3. 1. 0.]
125
126
          third level: [6. 5. 4. 2.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 8.10 temp_best_value_gen = 8.10
131
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 6
132
       solution chromosome =
          first level: [ [ 4.5 12.5 18. 22. ]
133
134
          second level: [1. 3. 1. 0.]
135
          third level: [6. 5. 4. 2.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 8.10 temp_best_value_gen = 8.10
140
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 7
141
        solution chromosome =
142
          first level: [ [ 4.5 12.5 18. 22. ]
143
          second level: [1. 3. 1. 0.]
          third level: [6. 5. 4. 2.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 8.10 temp_best_value_gen = 8.10
149
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 8
150
       solution chromosome =
151
          first level: [ [ 4.5 12.5 18. 22. ]
152
          second level: [1. 3. 1. 0.]
153
          third level: [6. 5. 4. 2.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 8.10 temp_best_value_gen = 8.10
158
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 9
159
        solution chromosome =
160
          first level: [ [ 4.5 12.5 18. 22. ]
          second level: [1. 3. 1. 0.]
161
162
          third level: [6. 5. 4. 2.]]
       The No. 14 iteration is finished!
163
```

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unknown
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 8.10 temp_best_value_gen = 8.10
166
167
        No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 10
168
        solution chromosome =
169
           first level: [ [ 4.5 12.5 18. 22. ]
          second level: [1. 3. 1. 0.]
170
171
           third level: [6. 5. 4. 2.]]
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: [ [ 4.5 12.5 18. 22. ]
179
           second level: [1. 3. 1. 0.]
           third level: [6. 5. 4. 2.]]
180
        Objective function values and some other indicators:
181
                                                       Obj0 + Obj1 = 9.00
182
           Obj0 = 4.00
                                 Obj1 = 5.00
183
           Total movement of crane: 0.00
184
           Total waiting time in berth position: 5.00
185
           Total index of q during berthing: 211.00
186
        Specific arrangement for each vessel:
                              li: 9.0
187
           V_id: 0
                                                  xi: 4.5
                                                                      bow of i: 0.0
                                                                                                 tail of i: 9.0
                                                                                                                          gama i0: 1.0
                                                                                                                                                     gama_i1: 3.0
                     duration\_time\_i{:}~2.0
                                                       demand_i: 160.0
                                                                                     work load_i: 160.0
                                                                                                                     work load gap_i: 0
188
           V_id: 1
                                                                        bow of i: 9.0
                              li: 7.0
                                                  xi: 12.5
                                                                                                    tail of i: 16.0
                                                                                                                               gama_i0: 3.0
                                                                                                                                                          gama_i1: 5
                       duration time i: 2.0
                                                          demand i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                        work load gap_i: 0
189
                                                  xi: 18.0
                                                                         bow of i: 16.0
                                                                                                    tail of i: 20.0
                                                                                                                               gama_i0: 1.0
           V_id: 2
                              li: 4.0
                                                                                                                                                          gama_i1: 2
                                                          demand_i: 80.0
                       duration_time_i: 1.0
                                                                                        work load_i: 80.0
                                                                                                                        work load gap_i: 0
                                                                         bow of i: 20.0
190
           V_id: 3
                              li: 4.0
                                                  xi: 22.0
                                                                                                    tail of i: 24.0
                                                                                                                               gama_i0: 0.0
                                                                                                                                                          gama_i1: 2
      .0
                       duration_time_i: 2.0
                                                          demand i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                        work load gap i: 0
191
192 Algorithm finished and the total CPU time: 685\ s
193 End
194
```