```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=36636
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_2_1 _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 = 14
21
       Pop\_size = 10
       Tolerance iteration unchanged number = 8
23
       Chrom size = 6
24
       Iter_num_GA = 300
25
       Select_rate = 0.85
26
       Crossover rate = 0.75
       Mutation rate = 0.8
27
28
       Mu_oper_type = 2
29
       vessel_move_way = 2
30
       coefficient for Obj1= 1.5
       coefficient for Obj2= 0.5
31
       gen = 0
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 9.29 temp_best_value_gen = 9.29
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 9.29 temp_best_value_gen = 9.29
41
     No, maintain solution and obj[gen] = 9.29, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [3.76 4.06]
       second level: [1. 0.]
44
       third level: [2. 8.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 9.29 temp_best_value_gen = 9.29
49
50
     No, maintain solution and obj[gen] = 9.29, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [3.76 4.06]
53
       second level: [1. 0.]
54
       third level: [2. 8.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 9.29 temp best value gen = 9.29
59
     No, maintain solution and obj[gen] = 9.29, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [ [3.76 4.06]
62
       second level: [1. 0.]
       third level: [2. 8.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 9.29 temp_best_value_gen = 9.18
68
     Yes, update solution and obj[gen] = 9.18
69
     solution chromosome =
70
       first level: [ [3.76 4.05]
       second level: [1. 0.]
71
       third level: [2. 7.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 9.18 temp best value gen = 9.18
76
     No, maintain solution and obj[gen] = 9.18, and the tolerance counter = 1
77
     solution chromosome =
78
       first level: [ [3.76 4.05]
```

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80
          second level: [1. 0.]
 81
          third level: [2. 7.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 9.18 temp best value gen = 9.18
       No, maintain solution and obj[gen] = 9.18, and the tolerance_counter = 2
 86
 87
        solution chromosome =
 88
          first level: [ [3.76 4.05]
 89
          second level: [1. 0.]
 90
          third level: [2. 7.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 9.18 temp_best_value_gen = 8.14
 94
 95
        Yes, update solution and obj[gen] = 8.14
 96
       solution chromosome =
 97
          first level: [ [3.76 4.01]
 98
          second level: [1. 0.]
 99
          third level: [2. 6.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 8.14 temp best value gen = 7.49
103
104
        Yes, update solution and obj[gen] = 7.49
105
       solution chromosome =
          first level: [ [2.16 4.1 ]
106
          second level: [1. 0.]
107
108
          third level: [3. 7.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 7.49 temp_best_value_gen = 7.49
113
       No, maintain solution and obj[gen] = 7.49, and the tolerance_counter = 1
       solution chromosome =
114
115
          first level: [ [2.16 4.1 ]
116
          second level: [1. 0.]
          third level: [3, 7,]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
       obj[gen-1] = 7.49 temp_best_value_gen = 7.49
121
       No, maintain solution and obj[gen] = 7.49, and the tolerance_counter = 2
122
123
        solution chromosome =
124
          first level: [ [2.16 4.1 ]
125
          second level: [1. 0.]
126
          third level: [3. 7.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 7.49 temp_best_value_gen = 7.49
131
       No, maintain solution and obj[gen] = 7.49, and the tolerance_counter = 3
132
       solution chromosome =
133
          first level: [ [2.16 4.1 ]
134
          second level: [1. 0.]
135
          third level: [3. 7.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
       obj[gen-1] = 7.49 temp_best_value_gen = 7.49
139
140
       No, maintain solution and obj[gen] = 7.49, and the tolerance_counter = 4
141
        solution chromosome =
142
          first level: [ [2.16 4.1 ]
          second level: [1. 0.]
143
          third level: [3. 7.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 7.49 temp_best_value_gen = 7.49
148
149
       No, maintain solution and obj[gen] = 7.49, and the tolerance_counter = 5
150
       solution chromosome =
151
          first level: [ [2.16 4.1 ]
152
          second level: [1. 0.]
153
          third level: [3. 7.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 7.49 temp_best_value_gen = 7.49
158
       No, maintain solution and obj[gen] = 7.49, and the tolerance_counter = 6
159
        solution chromosome =
160
          first level: [ [2.16 4.1 ]
          second level: [1. 0.]
161
162
          third level: [3. 7.]]
163
       The No. 14 iteration is finished!
```

```
unknown
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 7.49 temp_best_value_gen = 7.49
166
        No, maintain solution and obj[gen] = 7.49, and the tolerance_counter = 7
167
168
        solution chromosome =
169
           first level: [ [2.16 4.1 ]
170
           second level: [1. 0.]
171
           third level: [3. 7.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
        obj[gen-1] = 7.49 temp_best_value_gen = 7.49
176
        No, maintain solution and obj[gen] = 7.49, and the tolerance_counter = 8
177
        solution chromosome =
178
           first level: [ [2.16 4.1 ]
179
           second level: [1. 0.]
180
           third level: [3. 7.]
181
        The No. 16 iteration is finished!
182
183
184 ----
185 The iteration is terminated and then visulize the solution:
186
        solution chromosome =
187
           first level: [ [2.16 4.1 ]
188
           second level: [1. 0.]
           third level: [3. 7.]
189
190
        Objective function values and some other indicators:
191
                                Obj1 = 5.98
                                                      Obj0 + Obj1 = 8.98
           Obj0 = 3.00
192
           Total movement of crane: 4.98
193
           Total waiting time in berth position: 1.00
194
           Total index of q during berthing: 22.00
195
        Specific arrangement for each vessel:
                                                                     bow of i: 0.2
196
           V_id: 0
                              li: 4.0
                                                  xi: 2.2
                                                                                                tail of i: 4.2
                                                                                                                         gama_i0: 1.0
                                                                                                                                                    gama_i1: 4.0
                    duration_time_i: 3.0
                                                      demand_i: 160.0
                                                                                    work load_i: 160.0
                                                                                                                    work load gap_i: 0
197
                              li: 8.0
                                                                     bow of i: 0.1
                                                                                                                         gama_i0: 0.0
           V_id: 1
                                                  xi: 4.1
                                                                                                tail of i: 8.1
                                                                                                                                                    gama_i1: 1.0
                                                                                    work load_i: 120.0
                    duration_time_i: 1.0
                                                      demand_i: 120.0
                                                                                                                    work load gap_i: 0
198
199 Algorithm finished and the total CPU time: 138 s
200 End
201
```