```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=30544
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')
  Backend TkAgg is interactive backend. Turning interactive mode on.
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:
       trail = 10
20
21
       Pop\_size = 10
       Tolerance iteration unchanged number = 5
23
       Chrom size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.75
26
       Crossover rate = 0.75
       Mutation rate = 0.75
27
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 1
30
       coefficient for Obj1= 0.5
       coefficient for Obj2= 1.5
31
       gen = 0
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
36
     obj[0] = 17.00
                  temp_best_value_gen = 17.00
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 17.00 temp_best_value_gen = 17.00
41
     No, maintain solution and obj[gen] = 17.00, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [2. 8.]
       second level: [4, 5,]
44
       third level: [2. 5.]]
45
     The No. 1 iteration is finished!
46
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 17.00 temp_best_value_gen = 12.50
49
50
     Yes, update solution and obj[gen] = 12.50
51
     solution chromosome =
52
       first level: [ [8. 4.]
       second level: [5. 1.]
53
54
       third level: [3. 2.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
     obi[gen-1] = 12.50 temp best value gen = 12.50
59
     No, maintain solution and obj[gen] = 12.50, and the tolerance_counter = 1
60
     solution chromosome =
61
       first level: [ [8. 4.]
       second level: [5. 1.]
62
       third level: [3. 2.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 12.50 temp_best_value_gen = 11.00
68
     Yes, update solution and obj[gen] = 11.00
69
     solution chromosome =
70
       first level: [ [2. 8.]
71
       second level: [4. 1.]
       third level: [2. 2.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obj[gen-1] = 11.00 temp_best_value_gen = 11.00
76
     No, maintain solution and obj[gen] = 11.00, and the tolerance counter = 1
77
     solution chromosome =
78
       first level: [ [2. 8.]
```

```
second level: [4, 1,]
 81
          third level: [2. 2.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 11.00 temp_best_value_gen = 11.00
No, maintain solution_and obj[gen] = 11.00, and the tolerance_counter = 2
 85
 86
 87
        solution chromosome =
 88
          first level: [ [2. 8.]
 89
          second level: [4. 1.]
 90
          third level: [2. 2.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 11.00 temp_best_value_gen = 11.00
 94
 95
        No, maintain solution and obj[gen] = 11.00, and the tolerance_counter = 3
 96
        solution chromosome =
 97
          first level: [ [2. 8.]
 98
          second level: [4. 1.]
 99
          third level: [2. 2.]]
        The No. 7 iteration is finished!
100
101
102 Beging the No. 8 iteration:
        obj[gen-1] = 11.00 temp best value gen = 11.00
103
104
        No, maintain solution and obj[gen] = 11.00, and the tolerance_counter = 4
105
        solution chromosome =
          first level: [ [2. 8.]
106
107
          second level: [4. 1.]
108
          third level: [2. 2.]]
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 11.00 temp_best_value_gen = 5.00
113
        Yes, update solution and obj[gen] = 5.00
        solution chromosome =
114
115
          first level: [ [2. 8.]
116
          second level: [1. 1.]
          third level: [2, 2,]]
117
        The No. 9 iteration is finished!
118
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
        No, maintain solution and obj[\overline{gen}] = \overline{5.00}, and the tolerance_counter = 1
122
123
        solution chromosome =
124
          first level: [ [2. 8.]
125
          second level: [1. 1.]
126
          third level: [2. 2.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
131
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 2
132
        solution chromosome =
133
          first level: [ [2. 8.]
134
          second level: [1.1.]
135
          third level: [2. 2.]]
136
        The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
140
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 3
141
        solution chromosome =
142
          first level: [ [2. 8.]
143
          second level: [1. 1.]
          third level: [2. 2.]]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
148
149
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 4
150
        solution chromosome =
151
          first level: [ [2. 8.]
152
          second level: [1. 1.]
153
          third level: [2. 2.]]
154
        The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
158
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 5
159
        solution chromosome =
160
          first level: [ [2. 8.]
          second level: [1, 1,]
161
162
          third level: [2. 2.]]
163
        The No. 14 iteration is finished!
```

```
unknown
164
165
166
167
     The iteration is terminated and then visulize the solution:
168
        solution chromosome =
          first level: [ [2. 8.] second level: [1. 1.]
169
170
171
           third level: [2. 2.]]
172
        Objective function values and some other indicators:
                                 Obj1 = 2.00
173
           Obj0 = 4.00
                                                       Obj0 + Obj1 = 6.00
           Total movement of crane: 0.00
174
175
           Total waiting time in berth position: 2.00
176
           Total index of q during berthing: 31.00
177
        Specific arrangement for each vessel:
178
           V\_id{:}\ 0
                              li: 4.0
                                                   xi: 2.0
                                                                      bow of i: 0.0
                                                                                                  tail of i: 4.0
                                                                                                                           gama_i0: 1.0
                                                                                                                                                      gama_i1: 5.0
                     duration_time_i: 4.0
                                                       demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                      work load gap_i: 0
179
           V_id: 1
                                                   xi: 8.0
                                                                      bow of i: 4.0
                                                                                                  tail of i: 12.0
                                                                                                                             gama_i0: 1.0
                              li: 8.0
                                                                                                                                                         gama_i1: 4.0
                                                       demand_i: 120.0
                                                                                     work load_i: 120.0
                     duration_time_i: 3.0
                                                                                                                      work load gap_i: 0
180
181 Algorithm finished and the total CPU time: 114 s
182 End
183
```