```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=13465
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 = 4
20
21
       Pop\_size = 10
       Tolerance iteration unchanged number = 5
23
       Chrom\_size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.9
26
       Crossover rate = 0.85
       Mutation rate = 0.95
27
28
       Mu_oper_type = 2
29
       vessel\_move\_way = 1
30
       coefficient for Obj1= 1.0
       coefficient for Obj2= 1.0
31
       gen = 0
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 16.00
                  temp_best_value_gen = 16.00
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 16.00 temp_best_value_gen = 16.00
41
     No, maintain solution and obj[gen] = 16.00, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [2. 8.]
       second level: [5. 3.]
44
       third level: [2. 7.]]
45
     The No. 1 iteration is finished!
46
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 = 2
51
     solution chromosome =
52
       first level: [ [2. 8.]
       second level: [5. 3.]
53
54
       third level: [2. 7.]]
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 = 3
60
     solution chromosome =
61
       first level: [ [2. 8.]
62
       second level: [5. 3.]
       third level: [2. 7.]]
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 = 15.13
68
     Yes, update solution and obj[gen] = 15.13
     solution chromosome =
69
70
       first level: [ [2.47 4.13]
       second level: [2. 1.]
71
       third level: [3. 7.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 15.13 temp best value gen = 15.13
76
     No, maintain solution and obj[gen] = 15.13, and the tolerance_counter = 1
77
     solution chromosome =
78
       first level: [ [2.47 4.13]
```

```
80
          second level: [2, 1,]
 81
          third level: [3. 7.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 15.13 temp best value gen = 10.43
        Yes, update solution and obj[gen] = 10.43
 86
 87
       solution chromosome =
 88
          first level: [ [2.44 4.02]
 89
          second level: [2. 1.]
 90
          third level: [2. 7.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
       obj[gen-1] = 10.43 temp_best_value_gen = 10.43
 94
 95
       No, maintain solution and obj[gen] = 10.43, and the tolerance_counter = 1
 96
       solution chromosome =
 97
          first level: [ [2.44 4.02]
 98
          second level: [2. 1.]
          third level: [2. 7.]]
 99
       The No. 7 iteration is finished!
100
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 10.43 temp best value gen = 10.43
103
104
       No, maintain solution and obj[gen] = 10.43, and the tolerance_counter = 2
105
        solution chromosome =
          first level: [ [2.44 4.02]
106
          second level: [2. 1.]
107
108
          third level: [2. 7.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 10.43 temp_best_value_gen = 6.60
        Yes, update solution and obj[gen] = 6.60
113
       solution chromosome =
114
          first level: [ [2.24 4.02]
115
116
          second level: [1. 0.]
          third level: [2, 6,]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 6.60 temp_best_value_gen = 6.60
122
       No, maintain solution and obj[gen] = 6.60, and the tolerance_counter = 1
123
        solution chromosome =
124
          first level: [ [2.24 4.02]
125
          second level: [1. 0.]
126
          third level: [2. 6.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 6.60 temp_best_value_gen = 6.60
131
       No, maintain solution and obj[gen] = 6.60, and the tolerance_counter = 2
132
       solution chromosome =
133
          first level: [ [2.24 4.02]
134
          second level: [1. 0.]
135
          third level: [2. 6.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 6.60 temp_best_value_gen = 6.60
140
       No, maintain solution and obj[gen] = 6.60, and the tolerance_counter = 3
141
        solution chromosome =
142
          first level: [ [2.24 4.02]
          second level: [1. 0.]
143
          third level: [2. 6.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 6.60 temp_best_value_gen = 6.60
148
149
       No, maintain solution and obj[gen] = 6.60, and the tolerance_counter = 4
150
       solution chromosome =
          first level: [ [2.24 4.02]
151
152
          second level: [1. 0.]
153
          third level: [2. 6.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 6.60 temp_best_value_gen = 6.60
158
       No, maintain solution and obj[gen] = 6.60, and the tolerance_counter = 5
159
        solution chromosome =
160
          first level: [[2.24 4.02]
          second level: [1. 0.]
161
162
          third level: [2. 6.]]
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: [ [2.24 4.02] second level: [1. 0.]
169
170
171
           third level: [2. 6.]]
172
        Objective function values and some other indicators:
                                 Obj1 = 2.60
173
           Obj0 = 4.00
                                                        Obj0 + Obj1 = 6.60
           Total movement of crane: 1.60
174
175
           Total waiting time in berth position: 1.00
176
           Total index of q during berthing: 19.00
177
        Specific arrangement for each vessel:
                                                   xi: 2.2
178
           V\_id{:}\ 0
                               li: 4.0
                                                                        bow of i: 0.2
                                                                                                   tail of i: 4.2
                                                                                                                             gama_i0: 1.0
                                                                                                                                                         gama_i1: 5.0
                                                                                                                        work load gap_i: 0
gama_i0: 0.0
                     duration_time_i: 4.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
179
           V_id: 1
                                                                       bow of i: 0.0
                                                                                                   tail of i: 8.0
                               li: 8.0
                                                   xi: 4.0
                                                                                                                                                         gama_i1: 1.0
                                                        demand_i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                        work load gap_i: 0
                     duration_time_i: 1.0
180
181 Algorithm finished and the total CPU time: 114 s
182 End
183
```