```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=28701
 2
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
     01_My_Python_Code', 'E:/1 \\ \text{0} \\ \
     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.
12
13
    This is the R_4_10 _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] = 12.20 temp_best_value_gen = 12.20
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 12.20 temp_best_value_gen = 12.20
40
         No, maintain solution and obj[gen] = 12.20, and the tolerance_counter = 1
41
42
         solution chromosome =
43
             first level: [ [ 1.5 6. 16.5 10.5]
            second level: [0. 5. 2. 1.]
44
            third level: [1. 3. 3. 3.]
45
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
         obj[gen-1] = 12.20 temp_best_value_gen = 12.20
49
50
         No, maintain solution and obj[gen] = 12.20, and the tolerance_counter = 2
51
         solution chromosome =
52
             first level: [ [ 1.5 6. 16.5 10.5]
53
             second level: [0. 5. 2. 1.]
54
            third level: [1. 3. 3. 3.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 12.20 temp best value gen = 12.20
59
         No, maintain solution and obj[gen] = 12.20, and the tolerance_counter = 3
60
         solution chromosome =
61
             first level: [ [ 1.5 6. 16.5 10.5]
62
             second level: [0. 5. 2. 1.]
            third level: [1. 3. 3. 3.]]
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 12.20 temp_best_value_gen = 12.20
68
         No, maintain solution and obj[gen] = 12.20, and the tolerance_counter = 4
69
         solution chromosome =
70
             first level: [ [ 1.5 6. 16.5 10.5]
71
             second level: [0. 5. 2. 1.]
            third level: [1. 3. 3. 3.]]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obi[gen-1] = 12.20 temp best value gen = 12.20
76
         No, maintain solution and obj[gen] = 12.20, and the tolerance_counter = 5
77
78
         solution chromosome =
             first level: [ [ 1.5 6. 16.5 10.5]
```

```
80
          second level: [0. 5. 2. 1.]
 81
          third level: [1. 3. 3. 3.]]
        The No. 5 iteration is finished!
 82
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 12.20 temp best value gen = 12.20
       No, maintain solution and obj[gen] = 12.20, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [ 1.5 6. 16.5 10.5]
 89
          second level: [0. 5. 2. 1.]
 90
          third level: [1. 3. 3. 3.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
       obj[gen-1] = 12.20 temp_best_value_gen = 12.20
 94
 95
        No, maintain solution and obj[gen] = 12.20, and the tolerance_counter = 7
 96
       solution chromosome =
 97
          first level: [ [ 1.5 6. 16.5 10.5]
 98
          second level: [0. 5. 2. 1.]
99
          third level: [1. 3. 3. 3.]
100
       The No. 7 iteration is finished!
101
102
     Beging the No. 8 iteration:
       obj[gen-1] = 12.20 temp best value gen = 12.20
103
104
       No, maintain solution and obj[gen] = 12.20, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [ 1.5 6. 16.5 10.5]
106
107
          second level: [0. 5. 2. 1.]
          third level: [1. 3. 3. 3.]
108
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 12.20 temp_best_value_gen = 12.20
113
        No, maintain solution and obj[gen] = 12.20, and the tolerance_counter = 9
114
       solution chromosome =
115
          first level: [ [ 1.5 6. 16.5 10.5]
116
          second level: [0. 5. 2. 1.]
          third level: [1. 3. 3. 3.]
117
       The No. 9 iteration is finished!
118
119
120 Beging the No. 10 iteration:
       obj[gen-1] = 12.20 temp_best_value_gen = 12.20
121
       No, maintain solution and obj[gen] = 12.20, and the tolerance_counter = 10
122
123
        solution chromosome =
124
          first level: [ [ 1.5 6. 16.5 10.5]
125
          second level: [0. 5. 2. 1.]
126
          third level: [1. 3. 3. 3.]]
127
        The No. 10 iteration is finished!
128
129
130
131 The iteration is terminated and then visulize the solution:
132
       solution chromosome =
133
          first level: [ [ 1.5 6. 16.5 10.5]
134
          second level: [0. 5. 2. 1.]
135
          third level: [1. 3. 3. 3.]
136
       Objective function values and some other indicators:
          Obj0 = 6.00
                                                       Obj0 + Obj1 = 14.00
137
                                Obj1 = 8.00
138
          Total movement of crane: 0.00
139
          Total waiting time in berth position: 8.00
140
          Total index of q during berthing: 206.00
141
        Specific arrangement for each vessel:
                             li: 3.0
                                                                                                                          gama i0: 0.0
142
          V_id: 0
                                                  xi: 1.5
                                                                      bow of i: 0.0
                                                                                                 tail of i: 3.0
                                                                                                                                                     gama i1: 3.0
                    duration_time_i: 3.0
                                                       demand_i: 60.0
                                                                                     work load_i: 60.0
                                                                                                                     work load gap_i: 0
143
          V_id: 1
                              li: 6.0
                                                  xi: 6.0
                                                                      bow of i: 3.0
                                                                                                 tail of i: 9.0
                                                                                                                          gama_i0: 5.0
                                                                                                                                                      gama_i1: 7.0
                    duration_time_i: 2.0
                                                       demand_i: 120.0
                                                                                     work load_i: 120.0
                                                                                                                     work load gap_i: 0
144
          V id: 2
                                                                        bow of i: 15.0
                                                                                                   tail of i: 18.0
                                                                                                                               gama i0: 2.0
                              li: 3.0
                                                  xi: 16.5
                                                                                                                                                          gama_i1: 5
                       duration_time_i: 3.0
                                                         demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
     .0
                                                                        bow of i: 6.0
                                                                                                                               gama_i0: 1.0
145
                                                                                                   tail of i: 15.0
          V id: 3
                              li: 9.0
                                                  xi: 10.5
                                                                                                                                                           gama i1:4
                                                         demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
     .0
                      duration_time_i: 3.0
146
     Algorithm finished and the total CPU time: 513 s
147
148 End
149
```