```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=50643
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
 3
     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.
     Waiting 1s....
12
13
    This is the R_8_7 _standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
     Start
16
17
     Before iteration:
         Read basic data
18
19
         Parameter setting:
20
            trail = 58
21
             Pop_size = 30
             Tolerance iteration unchanged number = 10
23
             Chrom\_size = 24
            Iter_num_GA = 300
24
25
             Select_rate = 0.85
26
             Crossover rate = 0.95
27
             Mutation rate = 0.95
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] = 22.80 temp_best_value_gen = 22.80
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 22.80 temp_best_value_gen = 22.80
40
         No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 1
41
42
         solution chromosome =
43
             first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
             second level: [5. 6. 0. 1. 2. 1. 7. 1.]
44
            third level: [2. 3. 3. 9. 2. 2. 3. 2.]]
45
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
obj[gen-1] = 22.80 temp_best_value_gen = 22.80
49
50
         No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 2
51
         solution chromosome =
52
             first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
53
             second level: [5. 6. 0. 1. 2. 1. 7. 1.]
54
            third level: [2. 3. 3. 9. 2. 2. 3. 2.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 22.80 temp best value gen = 22.80
59
         No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 3
60
         solution chromosome =
61
             first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
62
             second level: [5. 6. 0. 1. 2. 1. 7. 1.]
            third level: [2. 3. 3. 9. 2. 2. 3. 2.]]
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
         obj[gen-1] = 22.80 temp_best_value_gen = 22.80
67
68
         No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 4
69
         solution chromosome =
             first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
70
71
             second level: [5. 6. 0. 1. 2. 1. 7. 1.]
            third level: [2. 3. 3. 9. 2. 2. 3. 2.]]
73
         The No. 4 iteration is finished!
74
75
    Beging the No. 5 iteration:
         obi[gen-1] = 22.80 temp best value gen = 22.80
76
         No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 5
77
         solution chromosome =
78
             first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
```

```
second level: [5. 6. 0. 1. 2. 1. 7. 1.]
 80
          third level: [2. 3. 3. 9. 2. 2. 3. 2.] ]
 81
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 22.80 temp_best_value_gen = 22.80
No, maintain solution_and obj[gen] = 22.80, and the tolerance_counter = 6
 85
 86
 87
        solution chromosome =
 88
          first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
 89
          second level: [5. 6. 0. 1. 2. 1. 7. 1.]
 90
          third level: [2. 3. 3. 9. 2. 2. 3. 2.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 22.80 temp\_best\_value\_gen = 22.80
 95
        No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 7
 96
        solution chromosome =
 97
          first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
 98
          second level: [5. 6. 0. 1. 2. 1. 7. 1.]
 99
          third level: [2. 3. 3. 9. 2. 2. 3. 2.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
103
        obj[gen-1] = 22.80 temp best value gen = 22.80
104
        No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
106
          second level: [5. 6. 0. 1. 2. 1. 7. 1.]
107
          third level: [2. 3. 3. 9. 2. 2. 3. 2.]]
108
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 22.80 temp\_best\_value\_gen = 22.80
        No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 9
113
114
        solution chromosome =
          first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
115
116
          second level: [5. 6. 0. 1. 2. 1. 7. 1.]
          third level: [2. 3. 3. 9. 2. 2. 3. 2.]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 22.80 temp_best_value_gen = 22.80
122
        No, maintain solution and obj[gen] = 22.80, and the tolerance_counter = 10
123
        solution chromosome =
124
          first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
125
          second level: [5. 6. 0. 1. 2. 1. 7. 1.]
126
          third level: [2. 3. 3. 9. 2. 2. 3. 2.]]
127
        The No. 10 iteration is finished!
128
129
130
131 The iteration is terminated and then visulize the solution:
132
        solution chromosome =
          first level: [ [ 3.5 8.5 11.5 17.5 23.5 27. 26.5 4. ]
133
134
          second level: [5. 6. 0. 1. 2. 1. 7. 1.]
135
          third level: [2. 3. 3. 9. 2. 2. 3. 2.]]
136
        Objective function values and some other indicators:
137
          Obi0 = 9.00
                                 Obj1 = 57.00
                                                        Obj0 + Obj1 = 66.00
138
           Total movement of crane: 34.00
139
          Total waiting time in berth position: 23.00
140
          Total index of q during berthing: 591.00
141
        Specific arrangement for each vessel:
                              li: 7.0
                                                                                                                             gama i0: 5.0
142
           V id: 0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 7.0
                                                                                                                                                          gama i1: 9.0
                    duration_time_i: 4.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
143
           V_id: 1
                              li: 3.0
                                                    xi: 8.5
                                                                        bow of i: 7.0
                                                                                                    tail of i: 10.0
                                                                                                                                gama_i0: 6.0
                                                                                                                                                             gama_i1: 8.0
                     duration_time_i: 2.0
                                                                                       work load_i: 120.0
                                                         demand_i: 120.0
                                                                                                                         work load gap_i: 0
144
           V id: 2
                                                                          bow of i: 10.0
                                                                                                      tail of i: 13.0
                                                                                                                                   gama i0: 0.0
                              li: 3.0
                                                   xi: 11.5
                                                                                                                                                               gama_i1: 2
                       duration time i: 2.0
                                                           demand_i: 120.0
                                                                                          work load_i: 120.0
                                                                                                                           work load gap_i: 0
     .0
                                                                                                                                   gama_i0: 1.0
145
           V id: 3
                               li: 9.0
                                                   xi: 17.5
                                                                          bow of i: 13.0
                                                                                                       tail of i: 22.0
                                                                                                                                                               gama i1:2
     .0
                       duration_time_i: 1.0
                                                           demand_i: 140.0
                                                                                          work load_i: 140.0
                                                                                                                           work load gap_i: 0
146
                                                                          bow of i: 22.0
                                                                                                                                   gama_i0: 2.0
           V_id: 4
                                                   xi: 23.5
                                                                                                      tail of i: 25.0
                              li: 3.0
                                                                                                                                                               gama i1:5
                                                                                          work load_i: 100.0
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 3.0
                                                           demand_i: 100.0
147
           V_id: 5
                               li: 4.0
                                                   xi: 27.0
                                                                          bow of i: 25.0
                                                                                                      tail of i: 29.0
                                                                                                                                   gama_i0: 1.0
                                                                                                                                                               gama_i1: 4
                       duration time i: 3.0
                                                           demand i: 100.0
                                                                                          work load_i: 100.0
                                                                                                                           work load gap i: 0
     .0
148
          V_id: 6
                                                   xi: 26.5
                                                                          bow of i: 23.0
                                                                                                      tail of i: 30.0
                              1i: 7.0
                                                                                                                                   gama_i0: 7.0
                                                                                                                                                               gama_i1:
     10.0
                          duration time i: 3.0
                                                              demand i: 140.0
                                                                                            work load i: 140.0
                                                                                                                              work load gap i: 0
149
           V_id: 7
                              li: 8.0
                                                                        bow of i: 0.0
                                                                                                   tail of i: 8.0
                                                                                                                             gama_i0: 1.0
                                                                                                                                                          gama_i1: 4.0
                    duration_time_i: 3.0
                                                        demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                         work load gap_i: 0
151
    Algorithm finished and the total CPU time: 1051 s
    End
152
153
```