```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=15719
 2
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
 3
     01_My_Python_Code', 'E:/1 \\ \text{0} \\ \
     01_My_Python_Code'])
 5
 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_2 _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
            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] = 26.40 temp_best_value_gen = 26.40
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 26.40 temp_best_value_gen = 26.40
40
         No, maintain solution and obj[gen] = 26.40, and the tolerance_counter = 1
41
42
         solution chromosome =
43
            first level: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
            second level: [ 8. 0. 5. 2. 0. 1. 4. 12.]
44
            third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
45
46
         The No. 1 iteration is finished!
47
     Beging the No. 2 iteration:
obj[gen-1] = 26.40 temp_best_value_gen = 26.40
48
49
50
         No, maintain solution and obj[gen] = 26.40, and the tolerance_counter = 2
51
         solution chromosome =
52
            first level: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
            second level: [ 8. 0. 5. 2. 0. 1. 4. 12.]
53
54
            third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 26.40 temp best value gen = 26.40
59
         No, maintain solution and obj[gen] = 26.40, and the tolerance_counter = 3
60
         solution chromosome =
61
            first level: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
62
            second level: [8. 0. 5. 2. 0. 1. 4. 12.]
            third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 26.40 temp_best_value_gen = 26.40
68
         No, maintain solution and obj[gen] = 26.40, and the tolerance_counter = 4
69
         solution chromosome =
70
            first level: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
            second level: [ 8. 0. 5. 2. 0. 1. 4. 12.]
71
            third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
73
         The No. 4 iteration is finished!
74
75
    Beging the No. 5 iteration:
         obi[gen-1] = 26.40 temp best value gen = 26.40
76
         No, maintain solution and obj[gen] = 26.40, and the tolerance_counter = 5
77
78
         solution chromosome =
             first level: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
```

```
second level: [ 8. 0. 5. 2. 0. 1. 4. 12.]
 80
          third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
 81
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 26.40 temp best value gen = 26.40
       No, maintain solution and obj[gen] = \overline{26.40}, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
 89
          second level: [ 8. 0. 5. 2. 0. 1. 4. 12.]
 90
          third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
        obj[gen-1] = 26.40 temp_best_value_gen = 26.40
 94
 95
        No, maintain solution and obj[gen] = 26.40, and the tolerance_counter = 7
 96
       solution chromosome =
 97
          first level: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
 98
          second level: [ 8. 0. 5. 2. 0. 1. 4. 12.]
 99
          third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
       obj[gen-1] = 26.40 temp best value gen = 26.40
103
104
       No, maintain solution and obj[gen] = 26.40, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
106
          second level: [ 8. 0. 5. 2. 0. 1. 4. 12.]
107
          third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
108
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 26.40 temp_best_value_gen = 26.40
        No, maintain solution and obj[gen] = 26.40, and the tolerance_counter = 9
113
114
       solution chromosome =
          first level: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
115
116
          second level: [ 8. 0. 5. 2. 0. 1. 4. 12.]
          third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
117
        The No. 9 iteration is finished!
118
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 26.40 temp_best_value_gen = 26.40
122
       No, maintain solution and obj[gen] = 26.40, and the tolerance_counter = 10
123
        solution chromosome =
124
          first level: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
125
          second level: [ 8. 0. 5. 2. 0. 1. 4. 12.]
126
          third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
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: [ [ 4.5 13.5 21.5 26. 3. 2. 2. 3.5]
134
          second level: [ 8. 0. 5. 2. 0. 1. 4. 12.]
135
          third level: [2. 6. 3. 2. 3. 1. 2. 5.]]
136
        Objective function values and some other indicators:
                                                       Obj0 + Obj1 = 48.00
137
          Obj0 = 12.00
                                Obj1 = 36.00
138
          Total movement of crane: 4.00
139
          Total waiting time in berth position: 32.00
140
          Total index of q during berthing: 319.00
141
        Specific arrangement for each vessel:
                             li: 9.0
                                                                                                                           gama i0: 8.0
142
          V id: 0
                                                  xi: 4.5
                                                                      bow of i: 0.0
                                                                                                 tail of i: 9.0
                                                                                                                                                      gama i1: 12.0
                    duration_time_i: 4.0
                                                       demand_i: 160.0
                                                                                     work load_i: 160.0
                                                                                                                      work load gap_i: 0
          V_id: 1
                                                                         bow of i: 9.0
143
                              li: 9.0
                                                  xi: 13.5
                                                                                                    tail of i: 18.0
                                                                                                                                gama_i0: 0.0
                                                                                                                                                            gama_i1: 1
                       duration_time_i: 1.0
                                                          demand_i: 100.0
                                                                                        work load_i: 100.0
                                                                                                                         work load gap_i: 0
     .0
144
          V id: 2
                                                  xi: 21.5
                                                                         bow of i: 18.0
                                                                                                    tail of i: 25.0
                                                                                                                                gama i0: 5.0
                              1i: 7.0
                                                                                                                                                            gama_i1: 7
                       duration time i: 2.0
                                                          demand_i: 120.0
                                                                                        work load_i: 120.0
                                                                                                                        work load gap_i: 0
     .0
145
          V id: 3
                              li: 8.0
                                                  xi: 26.0
                                                                         bow of i: 22.0
                                                                                                    tail of i: 30.0
                                                                                                                                gama_i0: 2.0
                                                                                                                                                            gama i1:5
                                                                                        work load_i: 120.0
                                                                                                                        work load gap_i: 0
     .0
                       duration_time_i: 3.0
                                                         demand_i: 120.0
146
                                                  xi: 3.0
                                                                                                                           gama_i0: 0.0
          V_id: 4
                                                                      bow of i: 0.0
                                                                                                 tail of i: 6.0
                                                                                                                                                       gama_i1: 1.0
                              li: 6.0
                                                       demand_i: 60.0
                                                                                     work load_i: 60.0
                                                                                                                      work load gap_i: 0
                    duration_time_i: 1.0
147
          V_id: 5
                                                  xi: 2.0
                                                                      bow of i: 0.0
                                                                                                                           gama_i0: 1.0
                              li: 4.0
                                                                                                  tail of i: 4.0
                                                                                                                                                       gama_i1: 4.0
                    duration time i: 3.0
                                                       demand i: 60.0
                                                                                     work load i: 60.0
                                                                                                                      work load gap i: 0
148
          V id: 6
                                                                      bow of i: 0.0
                                                                                                  tail of i: 40
                              li: 4.0
                                                  xi: 2.0
                                                                                                                           gama_i0: 4.0
                                                                                                                                                       gama_i1: 8.0
                    duration_time_i: 4.0
                                                       demand i: 160.0
                                                                                     work load i: 160.0
                                                                                                                      work load gap i: 0
                                                                                                 tail of i: 7.0
149
          V_id: 7
                              li: 7.0
                                                  xi: 3.5
                                                                      bow of i: 0.0
                                                                                                                           gama_i0: 12.0
                                                                                                                                                       gama_i1: 13.0
                    duration_time_i: 1.0
                                                       demand i: 100.0
                                                                                     work load_i: 100.0
                                                                                                                      work load gap_i: 0
151 Algorithm finished and the total CPU time: 930 s
152
    End
153
```