```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=4786
 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.
     Waiting 1s....
12
13
    This is the R_5_9 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 = 15
            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] = 29.70 temp_best_value_gen = 29.70
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 29.70 temp_best_value_gen = 21.60
40
         Yes, update solution and obj[gen] = 21.60
41
         solution chromosome =
42
43
             first level: [ [ 3. 26. 16. 21. 10.]
44
            second level: [3. 5. 4. 1. 1.]
45
            third level: [2. 3. 2. 2. 6.]]
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
obj[gen-1] = 21.60 temp_best_value_gen = 21.60
49
50
         No, maintain solution and obj[gen] = 21.60, and the tolerance_counter = 1
51
         solution chromosome =
52
             first level: [ [ 3. 26. 16. 21. 10.]
53
             second level: [3. 5. 4. 1. 1.]
54
            third level: [2. 3. 2. 2. 6.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 21.60 temp best value gen = 21.60
59
         No, maintain solution and obj[gen] = 21.60, and the tolerance_counter = 2
60
         solution chromosome =
61
             first level: [ [ 3. 26. 16. 21. 10.]
62
             second level: [3. 5. 4. 1. 1.]
63
            third level: [2. 3. 2. 2. 6.]]
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 21.60 temp_best_value_gen = 21.60
68
         No, maintain solution and obj[gen] = 21.60, and the tolerance_counter = 3
69
         solution chromosome =
70
             first level: [ [ 3. 26. 16. 21. 10.]
71
             second level: [3. 5. 4. 1. 1.]
            third level: [2. 3. 2. 2. 6.]]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obi[gen-1] = 21.60 temp best value gen = 21.60
76
         No, maintain solution and obj[gen] = 21.60, and the tolerance_counter = 4
77
78
         solution chromosome =
             first level: [ [ 3. 26. 16. 21. 10.]
```

```
second level: [3, 5, 4, 1, 1,]
 80
 81
          third level: [2. 3. 2. 2. 6.]]
        The No. 5 iteration is finished!
 82
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 21.60 temp_best_value_gen = 21.60
No, maintain solution_and_obj[gen] = 21.60, and the tolerance_counter = 5
 85
 86
 87
        solution chromosome =
 88
          first level: [ [ 3. 26. 16. 21. 10.]
 89
          second level: [3. 5. 4. 1. 1.]
 90
          third level: [2. 3. 2. 2. 6.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
        obj[gen-1] = 21.60 temp_best_value_gen = 21.60
 94
 95
        No, maintain solution and obj[gen] = 21.60, and the tolerance_counter = 6
 96
        solution chromosome =
 97
          first level: [ [ 3. 26. 16. 21. 10.]
 98
          second level: [3. 5. 4. 1. 1.]
 99
          third level: [2. 3. 2. 2. 6.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
        obj[gen-1] = 21.60 temp best value gen = 21.60
103
104
        No, maintain solution and obj[gen] = 21.60, and the tolerance_counter = 7
105
        solution chromosome
          first level: [ [ 3. 26. 16. 21. 10.]
106
          second level: [3. 5. 4. 1. 1.]
107
108
          third level: [2. 3. 2. 2. 6.]]
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 21.60 temp\_best\_value\_gen = 21.60
113
        No, maintain solution and obj[gen] = 21.60, and the tolerance_counter = 8
114
        solution chromosome =
115
          first level: [ [ 3. 26. 16. 21. 10.]
116
          second level: [3. 5. 4. 1. 1.]
          third level: [2, 3, 2, 2, 6,]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 21.60 temp\_best\_value\_gen = 21.60
        No, maintain solution and obj[gen] = 21.60, and the tolerance_counter = 9
122
123
        solution chromosome
124
          first level: [ [ 3. 26. 16. 21. 10.]
125
          second level: [3. 5. 4. 1. 1.]
126
          third level: [2. 3. 2. 2. 6.]]
127
        The No. 10 iteration is finished!
128
129
     Beging the No. 11 iteration:
130
        obj[gen-1] = 21.60 temp best value gen = 21.60
131
        No, maintain solution and obj[gen] = 21.60, and the tolerance_counter = 10
132
        solution chromosome =
133
          first level: [ [ 3. 26. 16. 21. 10.]
134
          second level: [3. 5. 4. 1. 1.]
135
          third level: [2. 3. 2. 2. 6.]]
136
        The No. 11 iteration is finished!
137
138
139
140 The iteration is terminated and then visulize the solution:
141
        solution chromosome =
          first level: [ [ 3. 26. 16. 21. 10.]
142
143
          second level: [3. 5. 4. 1. 1.]
          third level: [2. 3. 2. 2. 6.]]
144
145
        Objective function values and some other indicators:
146
          Obj0 = 10.00
                                 Obj1 = 26.00
                                                        Obj0 + Obj1 = 36.00
147
          Total movement of crane: 12.00
148
          Total waiting time in berth position: 14.00
149
          Total index of q during berthing: 582.00
150
        Specific arrangement for each vessel:
151
           V_id: 0
                               li: 6.0
                                                   xi: 3.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 6.0
                                                                                                                              gama_i0: 3.0
                                                                                                                                                          gama_i1: 5.0
                     duration_time_i: 2.0
                                                        demand_i: 80.0
                                                                                        work load i: 80.0
                                                                                                                         work load gap_i: 0
152
           V id: 1
                              li: 8.0
                                                   xi: 26.0
                                                                          bow of i: 22.0
                                                                                                      tail of i: 30.0
                                                                                                                                   gama i0: 5.0
                                                                                                                                                               gama_i1: 8
                                                           demand_i: 140.0
                                                                                          work load_i: 140.0
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 3.0
153
           V id: 2
                               li: 4.0
                                                   xi: 16.0
                                                                          bow of i: 14.0
                                                                                                      tail of i: 18.0
                                                                                                                                   gama i0: 4.0
                                                                                                                                                               gama i1:
     11.0
                          duration_time_i: 7.0
                                                             demand_i: 280.0
                                                                                             work load_i: 280.0
                                                                                                                              work load gap_i: 0
           V_id: 3
154
                                                   xi: 21.0
                                                                          bow of i: 18.0
                                                                                                      tail of i: 24.0
                                                                                                                                   gama_i0: 1.0
                                                                                                                                                               gama_i1: 5
                              li: 6.0
     .0
                       duration_time_i: 4.0
                                                           demand_i: 160.0
                                                                                          work load_i: 160.0
                                                                                                                           work load gap_i: 0
155
           V id: 4
                               li: 6.0
                                                    xi: 10.0
                                                                          bow of i: 7.0
                                                                                                      tail of i: 13.0
                                                                                                                                   gama_i0: 1.0
                                                                                                                                                               gama_i1: 3
                                                           demand i: 180.0
     .0
                       duration time i: 2.0
                                                                                          work load i: 180.0
                                                                                                                           work load gap_i: 0
156
     Algorithm finished and the total CPU time: 714 s
157
158 End
```