```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=28462
 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'])
 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_9_9 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 = 27
            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
34
     Iteration begin:
35
     Beging the No. 0 iteration:
         obj[0] = 19.40 temp_best_value_gen = 19.40
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 19.40 temp_best_value_gen = 19.40
40
         No, maintain solution and obj[gen] = 19.40, and the tolerance_counter = 1
41
42
         solution chromosome =
43
            first level: [ [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
            second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
44
            third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
45
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
         obj[gen-1] = 19.40 temp_best_value_gen = 19.40
49
50
         No, maintain solution and obj[gen] = 19.40, and the tolerance_counter = 2
51
         solution chromosome =
52
            first level: [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
            second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
53
54
            third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 19.40 temp best value gen = 19.40
59
         No, maintain solution and obj[gen] = 19.40, and the tolerance_counter = 3
60
         solution chromosome =
61
            first level: [ [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
            second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
62
            third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 19.40 temp_best_value_gen = 19.40
68
         No, maintain solution and obj[gen] = 19.40, and the tolerance_counter = 4
69
         solution chromosome =
70
            first level: [ [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
            second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
71
            third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obi[gen-1] = 19.40 temp best value gen = 19.40
76
         No, maintain solution and obj[gen] = 19.40, and the tolerance_counter = 5
77
78
         solution chromosome =
             first level: [ [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
```

```
second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
 80
          third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
 81
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 19.40 temp best value gen = 19.40
       No, maintain solution and obj[gen] = 19.40, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
          second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
 89
 90
          third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 19.40 temp\_best\_value\_gen = 19.40
 95
        No, maintain solution and obj[gen] = 19.40, and the tolerance_counter = 7
 96
       solution chromosome =
 97
          first level: [ [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
          second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
 98
 99
          third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
100
        The No. 7 iteration is finished!
101
102
     Beging the No. 8 iteration:
       obj[gen-1] = 19.40 temp best value gen = 19.40
103
104
       No, maintain solution and obj[gen] = 19.40, and the tolerance_counter = 8
105
        solution chromosome
106
          first level: [ [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
          second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
107
          third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
108
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 19.40 temp\_best\_value\_gen = 19.40
        No, maintain solution and obj[gen] = 19.40, and the tolerance_counter = 9
113
114
       solution chromosome =
          first level: [ [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
115
116
          second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
          third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 19.40 temp_best_value_gen = 19.40
122
       No, maintain solution and obj[gen] = 19.40, and the tolerance_counter = 10
123
        solution chromosome =
124
          first level: [ [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
125
          second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
126
          third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
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: [ [ 2. 7. 12. 18. 25.5 3. 1.5 3.5 3.5]
133
134
          second level: [0. 1. 2. 2. 4. 3. 5. 2. 7.]
135
          third level: [2. 3. 3. 3. 4. 2. 3. 6. 3.]]
136
        Objective function values and some other indicators:
137
          Obj0 = 8.00
                                 Obj1 = 42.00
                                                       Obj0 + Obj1 = 50.00
138
          Total movement of crane: 16.00
139
          Total waiting time in berth position: 26.00
140
          Total index of q during berthing: 285.00
141
        Specific arrangement for each vessel:
142
          V_id: 0
                              li: 4.0
                                                  xi: 2.0
                                                                       bow of i: 0.0
                                                                                                  tail of i: 4.0
                                                                                                                            gama i0: 0.0
                                                                                                                                                        gama i1: 2.0
                    duration_time_i: 2.0
                                                        demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap_i: 0
143
          V_id: 1
                              li: 6.0
                                                   xi: 7.0
                                                                       bow of i: 4.0
                                                                                                   tail of i: 10.0
                                                                                                                              gama_i0: 1.0
                                                                                                                                                           gama_i1: 2.0
                                                        demand_i: 60.0
                                                                                      work load_i: 60.0
                    duration_time_i: 1.0
                                                                                                                       work load gap_i: 0
144
          V id: 2
                              1i: 4.0
                                                                         bow of i: 10.0
                                                                                                     tail of i: 14.0
                                                                                                                                 gama i0: 2.0
                                                  xi: 12.0
                                                                                                                                                             gama il: 4
                       duration time i: 2.0
                                                          demand_i: 80.0
                                                                                         work load_i: 80.0
                                                                                                                         work load gap_i: 0
     .0
                                                                                                                                 gama_i0: 2.0
145
          V id: 3
                              li: 8.0
                                                   xi: 18.0
                                                                         bow of i: 14.0
                                                                                                     tail of i: 22.0
                                                                                                                                                             gama i1:4
                                                                                                                         work load gap_i: 0
     .0
                       duration_time_i: 2.0
                                                          demand_i: 100.0
                                                                                         work load_i: 100.0
146
          V_id: 4
                              li: 9.0
                                                                                                     tail of i: 30.0
                                                                         bow of i: 21.0
                                                                                                                                 gama_i0: 4.0
                                                   xi: 25.5
                                                                                                                                                             gama i1:6
                       duration\_time\_i{:}~2.0
                                                                                                                         work load gap_i: 0
     .0
                                                          demand_i: 120.0
                                                                                         work load_i: 120.0
                                                                       bow of i: 0.0
147
          V_id: 5
                                                   xi: 3.0
                                                                                                                            gama_i0: 3.0
                                                                                                                                                        gama_i1: 5.0
                              li: 6.0
                                                                                                   tail of i: 6.0
                    duration time i: 2.0
                                                        demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap i: 0
148
          V id: 6
                                                                       bow of i: 0.0
                              li: 3.0
                                                   xi: 1.5
                                                                                                   tail of i: 3.0
                                                                                                                            gama_i0: 5.0
                                                                                                                                                        gama_i1: 7.0
                    duration time i: 2.0
                                                        demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap i: 0
149
          V_id: 7
                              li: 7.0
                                                   xi: 3.5
                                                                       bow of i: 0.0
                                                                                                  tail of i: 7.0
                                                                                                                            gama_i0: 2.0
                                                                                                                                                        gama_i1: 3.0
                    duration_time_i: 1.0
                                                        demand_i: 120.0
                                                                                      work load_i: 120.0
                                                                                                                       work load gap_i: 0
150
                                                                       bow of i: 0.0
                                                                                                   tail of i: 7.0
          V id: 8
                              li: 7.0
                                                   xi: 3.5
                                                                                                                            gama_i0: 7.0
                                                                                                                                                        gama_i1: 9.0
                    duration_time_i: 2.0
                                                        demand i: 120.0
                                                                                      work load_i: 120.0
                                                                                                                       work load gap_i: 0
152 Algorithm finished and the total CPU time: 1074 s
153 End
154
```