```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=30067
 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_10_4_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 = 30
            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] = 26.50 temp_best_value_gen = 26.50
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 26.50 temp_best_value_gen = 26.50
40
         No, maintain solution and obj[gen] = 26.50, and the tolerance_counter = 1
41
42
         solution chromosome =
43
            first level: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
            second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
44
            third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
45
46
         The No. 1 iteration is finished!
47
     Beging the No. 2 iteration:
obj[gen-1] = 26.50 temp_best_value_gen = 26.50
48
49
50
         No, maintain solution and obj[gen] = 26.50, and the tolerance_counter = 2
51
         solution chromosome =
            first level: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
52
53
            second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
54
            third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 26.50 temp best value gen = 26.50
59
         No, maintain solution and obj[gen] = 26.50, and the tolerance_counter = 3
60
         solution chromosome =
61
            first level: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
62
            second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
            third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 26.50 temp_best_value_gen = 26.50
68
         No, maintain solution and obj[gen] = 26.50, and the tolerance_counter = 4
69
         solution chromosome =
            first level: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
70
            second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
71
            third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
73
         The No. 4 iteration is finished!
74
75
    Beging the No. 5 iteration:
         obi[gen-1] = 26.50 temp best value gen = 26.50
76
         No, maintain solution and obj[gen] = 26.50, and the tolerance_counter = 5
77
78
         solution chromosome =
             first level: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
```

```
80
          second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
 81
          third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 26.50 temp best value gen = 26.50
       No, maintain solution and obj[gen] = 26.50, and the tolerance_counter = 6
 86
        solution chromosome =
 87
 88
          first level: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
 89
          second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
 90
          third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
        obj[gen-1] = 26.50 temp_best_value_gen = 26.50
 94
 95
        No, maintain solution and obj[gen] = 26.50, and the tolerance_counter = 7
 96
       solution chromosome =
 97
          first level: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
 98
          second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
 99
          third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
100
       The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
       obj[gen-1] = 26.50 temp best value gen = 26.50
103
104
       No, maintain solution and obj[gen] = 26.50, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
106
          second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
107
108
          third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 26.50 temp_best_value_gen = 26.50
        No, maintain solution and obj[gen] = 26.50, and the tolerance_counter = 9
113
114
       solution chromosome =
115
          first level: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
116
          second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
          third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 26.50 temp_best_value_gen = 26.50
122
       No, maintain solution and obj[gen] = 26.50, and the tolerance_counter = 10
123
        solution chromosome =
124
          first level: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
125
          second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
126
          third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
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: [ [ 2.5 7. 11.5 17.5 25. 26. 4. 3. 2.5 2. ]
134
          second level: [0. 4. 2. 1. 3. 1. 2. 3. 4. 6.]
135
          third level: [2. 2. 2. 4. 6. 6. 6. 3. 2. 2.]]
136
        Objective function values and some other indicators:
          Obj0 = 9.00
                                 Obj1 = 94.00
                                                       Obj0 + Obj1 = 103.00
137
138
          Total movement of crane: 68.00
139
          Total waiting time in berth position: 26.00
140
          Total index of q during berthing: 391.00
141
        Specific arrangement for each vessel:
                                                                                                                            gama i0: 0.0
142
          V id: 0
                              li: 5.0
                                                                       bow of i: 0.0
                                                                                                  tail of i: 5.0
                                                                                                                                                        gama i1: 2.0
                    duration_time_i: 2.0
                                                        demand_i: 60.0
                                                                                      work load_i: 60.0
                                                                                                                       work load gap_i: 0
143
          V_id: 1
                                                   xi: 7.0
                                                                       bow of i: 5.0
                              li: 4.0
                                                                                                   tail of i: 9.0
                                                                                                                            gama_i0: 4.0
                                                                                                                                                        gama_i1: 7.0
                    duration_time_i: 3.0
                                                        demand_i: 120.0
                                                                                      work load_i: 120.0
                                                                                                                       work load gap_i: 0
144
          V id: 2
                                                                         bow of i: 9.0
                                                                                                     tail of i: 14.0
                                                                                                                                 gama i0: 2.0
                              li: 5.0
                                                  xi: 11.5
                                                                                                                                                             gama_i1: 5
                       duration time i: 3.0
                                                          demand_i: 100.0
                                                                                         work load_i: 100.0
                                                                                                                         work load gap_i: 0
     .0
                                                                                                                                 gama_i0: 1.0
145
          V id: 3
                              1i: 7.0
                                                   xi: 17.5
                                                                         bow of i: 14.0
                                                                                                     tail of i: 21.0
                                                                                                                                                             gama i1:3
                                                          demand_i: 100.0
                                                                                        work load_i: 100.0
                                                                                                                         work load gap_i: 0
     .0
                       duration_time_i: 2.0
146
          V_id: 4
                                                                                                                                 gama_i0: 3.0
                                                  xi: 25.0
                                                                         bow of i: 21.0
                                                                                                     tail of i: 29.0
                                                                                                                                                             gama_i1: 4
                              li: 8.0
                                                                                                                         work load gap_i: 0
     .0
                       duration_time_i: 1.0
                                                          demand_i: 60.0
                                                                                         work load_i: 60.0
                                                                                                                                 gama_i0: 1.0
147
          V_id: 5
                              li: 8.0
                                                   xi: 26.0
                                                                         bow of i: 22.0
                                                                                                     tail of i: 30.0
                                                                                                                                                             gama_i1: 3
                                                                                        work load i: 160.0
                                                                                                                         work load gap i: 0
                       duration time i: 2.0
                                                          demand i: 160.0
148
          V_id: 6
                                                   xi: 4.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 8.0
                                                                                                                            gama_i0: 2.0
                              1i: 8.0
                                                                                                                                                        gama_i1: 3.0
                                                        demand i: 80.0
                    duration time i: 1.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap i: 0
149
          V_id: 7
                              li: 6.0
                                                   xi: 3.0
                                                                       bow of i: 0.0
                                                                                                  tail of i: 6.0
                                                                                                                            gama_i0: 3.0
                                                                                                                                                        gama_i1: 4.0
                    duration_time_i: 1.0
                                                        demand i: 60.0
                                                                                      work load i: 60.0
                                                                                                                       work load gap_i: 0
150
                                                                                                   tail of i: 5.0
          V_id: 8
                              li: 5.0
                                                   xi: 2.5
                                                                       bow of i: 0.0
                                                                                                                            gama_i0: 4.0
                                                                                                                                                        gama_i1: 6.0
                    duration_time_i: 2.0
                                                        demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap_i: 0
151
          V id: 9
                                                                       bow of i: 0.0
                              li: 4.0
                                                  xi: 2.0
                                                                                                   tail of i: 4.0
                                                                                                                            gama i0: 6.0
                                                                                                                                                        gama i1: 10.0
                                                        demand i: 160.0
                                                                                      work load i: 160.0
                    duration time i: 4.0
                                                                                                                       work load gap_i: 0
152
153 Algorithm finished and the total CPU time: 1193 s
```

154 End		
154 End 155		