```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=4825
 2
 3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   01 My Python Code', 'E:/1 0000/3 00000/1 000000/1 0000000/1 000000 0000/1 LW 00002/6 0000/2 python code/
   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_14_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 = 42
       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] = 74.70 temp_best_value_gen = 74.70
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 74.70 temp_best_value_gen = 74.70
40
     No, maintain solution and obj[gen] = 74.70, and the tolerance_counter = 1
41
42
     solution chromosome =
43
        first level: [ [ 4.5 10.5 14. 20.5 25.5 3. 3.5 3. 2.5 4.5 1.5 2. 3.5 3. ]
44
        second level: [1. 0. 1. 5. 3. 4. 7. 8. 11. 0. 13. 14. 18. 21.]
45
       third level: [3. 3. 3. 8. 3. 2. 3. 3. 3. 9. 3. 2. 2. 2.]]
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
obj[gen-1] = 74.70 temp_best_value_gen = 74.70
49
50
     No, maintain solution and obj[gen] = 74.70, and the tolerance_counter = 2
51
     solution chromosome =
52
        first level: [ [ 4.5 10.5 14. 20.5 25.5 3. 3.5 3. 2.5 4.5 1.5 2. 3.5 3. ]
53
        second level: [ 1. 0. 1. 5. 3. 4. 7. 8. 11. 0. 13. 14. 18. 21.]
54
       third level: [3. 3. 3. 8. 3. 2. 3. 3. 3. 9. 3. 2. 2. 2.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 74.70 temp best value gen = 74.70
59
     No, maintain solution and obj[gen] = 74.70, and the tolerance_counter = 3
60
     solution chromosome =
        first level: [ [ 4.5 10.5 14. 20.5 25.5 3. 3.5 3. 2.5 4.5 1.5 2. 3.5 3. ]
61
       second level: [ 1. 0. 1. 5. 3. 4. 7. 8.11. 0.13.14.18.21.] third level: [ 3. 3. 3. 8. 3. 2. 3. 3. 9. 3. 2. 2. 2. ] ]
62
63
64
     The No. 3 iteration is finished!
65
   Beging the No. 4 iteration:
66
     obj[gen-1] = 74.70 temp_best_value_gen = 74.70
67
68
     No, maintain solution and obj[gen] = 74.70, and the tolerance_counter = 4
69
     solution chromosome =
70
        first level: [ [ 4.5 10.5 14. 20.5 25.5 3. 3.5 3. 2.5 4.5 1.5 2. 3.5 3. ]
        second level: [1. 0. 1. 5. 3. 4. 7. 8. 11. 0. 13. 14. 18. 21.]
71
        third level: [3. 3. 3. 8. 3. 2. 3. 3. 3. 9. 3. 2. 2. 2.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 74.70 temp best value gen = 74.70
76
     No, maintain solution and obj[gen] = 74.70, and the tolerance_counter = 5
77
78
     solution chromosome =
        first level: [ [ 4.5 10.5 14. 20.5 25.5 3. 3.5 3. 2.5 4.5 1.5 2. 3.5 3. ]
```

```
second level: [ 1. 0. 1. 5. 3. 4. 7. 8. 11. 0. 13. 14. 18. 21.]
 80
 81
          third level: [3. 3. 3. 8. 3. 2. 3. 3. 3. 9. 3. 2. 2. 2.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 84
       obj[gen-1] = 74.70 temp_best_value_gen = 74.70
No, maintain solution_and obj[gen] = 74.70, and the tolerance_counter = 6
 85
 86
 87
        solution chromosome =
          first level: [ [ 4.5 10.5 14. 20.5 25.5 3. 3.5 3. 2.5 4.5 1.5 2. 3.5 3. ]
 88
 89
          second level: [1, 0, 1, 5, 3, 4, 7, 8, 11, 0, 13, 14, 18, 21,]
 90
          third level: [3. 3. 3. 8. 3. 2. 3. 3. 3. 9. 3. 2. 2. 2.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
        obj[gen-1] = 74.70 temp_best_value_gen = 74.70
 94
 95
        No, maintain solution and obj[gen] = 74.70, and the tolerance_counter = 7
 96
        solution chromosome =
 97
          first level: [[4.5 10.5 14. 20.5 25.5 3. 3.5 3. 2.5 4.5 1.5 2. 3.5 3.]
 98
           second level: [1. 0. 1. 5. 3. 4. 7. 8. 11. 0. 13. 14. 18. 21.]
 99
          third level: [3. 3. 3. 8. 3. 2. 3. 3. 3. 9. 3. 2. 2. 2.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
103
        obj[gen-1] = 74.70 temp best value gen = 74.70
        No, maintain solution and obj[gen] = 74.70, and the tolerance_counter = 8
104
105
        solution chromosome =
          first level: [ [ 4.5 10.5 14. 20.5 25.5 3. 3.5 3. 2.5 4.5 1.5 2. 3.5 3. ]
106
107
           second level: [ 1. 0. 1. 5. 3. 4. 7. 8. 11. 0. 13. 14. 18. 21.]
          third level: [3. 3. 3. 8. 3. 2. 3. 3. 3. 9. 3. 2. 2. 2.]]
108
109
        The No. 8 iteration is finished!
110
111
112
113
     The iteration is terminated and then visulize the solution:
114
        solution chromosome =
           first level: [ [ 4.5 10.5 14. 20.5 25.5 3. 3.5 3. 2.5 4.5 1.5 2. 3.5 3. ]
115
116
           second level: [ 1. 0. 1. 5. 3. 4. 7. 8. 11. 0. 13. 14. 18. 21.]
          third level: [3. 3. 3. 8. 3. 2. 3. 3. 3. 9. 3. 2. 2. 2.]]
117
118
        Objective function values and some other indicators:
119
           Obi0 = 24.00
                                 Obj1 = 291.00
                                                           Obj0 + Obj1 = 315.00
120
          Total movement of crane: 6.00
121
           Total waiting time in berth position: 106.00
122
          Total index of q during berthing: 370.00
123
        Specific arrangement for each vessel:
124
           V_id: 0
                               li: 9.0
                                                   xi: 4.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 9.0
                                                                                                                             gama_i0: 1.0
                                                                                                                                                          gama_i1: 4.0
                     duration_time_i: 3.0
                                                        demand i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                         work load gap i: 0
                                                                          bow of i: 9.0
125
           V_id: 1
                               li: 3.0
                                                   xi: 10.5
                                                                                                      tail of i: 12.0
                                                                                                                                   gama_i0: 0.0
                                                                                                                                                               gama_i1: 1
     .0
                       duration_time_i: 1.0
                                                           demand_i: 60.0
                                                                                          work load_i: 60.0
                                                                                                                           work load gap_i: 0
126
           V_id: 2
                               li: 4.0
                                                                          bow of i: 12.0
                                                                                                      tail of i: 16.0
                                                                                                                                  gama i0: 1.0
                                                   xi: 14.0
                                                                                                                                                               gama il: 4
      .0
                       duration_time_i: 3.0
                                                           demand i: 160.0
                                                                                          work load i: 160.0
                                                                                                                           work load gap_i: 0
127
           V id: 3
                               li: 9.0
                                                   xi: 20.5
                                                                          bow of i: 16.0
                                                                                                      tail of i: 25.0
                                                                                                                                   gama i0: 5.0
                                                                                                                                                               gama il: 6
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 1.0
                                                           demand_i: 100.0
                                                                                          work load_i: 100.0
128
           V id: 4
                               li: 9.0
                                                                          bow of i: 21.0
                                                   xi: 25.5
                                                                                                      tail of i: 30.0
                                                                                                                                   gama i0: 3.0
                                                                                                                                                               gama i1:5
                                                           demand_i: 100.0
                                                                                          work load i: 100.0
                       duration_time_i: 2.0
                                                                                                                           work load gap_i: 0
129
           V_id: 5
                                                   xi: 3.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 6.0
                                                                                                                             gama_i0: 4.0
                                                                                                                                                          gama_i1: 7.0
                               li: 6.0
                     duration time i: 3.0
                                                        demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                         work load gap i: 0
           V_id: 6
130
                               li: 7.0
                                                   xi: 3.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 7.0
                                                                                                                             gama i0: 7.0
                                                                                                                                                          gama i1: 8.0
                     duration_time_i: 1.0
                                                        demand_i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                         work load gap_i: 0
                                                                        bow of i: 0.0
131
           V_id: 7
                               li: 6.0
                                                   xi: 3.0
                                                                                                    tail of i: 6.0
                                                                                                                             gama_i0: 8.0
                                                                                                                                                          gama_i1: 11.0
                     duration_time_i: 3.0
                                                        demand i: 160.0
                                                                                                                         work load gap_i: 0
                                                                                       work load i: 160.0
                                                                        bow of i: 0.0
                                                                                                                             gama_i0: 11.0
132
           V id: 8
                               li: 5.0
                                                   xi: 2.5
                                                                                                    tail of i: 5.0
                                                                                                                                                          gama_i1: 13.0
                     duration time i: 2.0
                                                         demand i: 80.0
                                                                                       work load i: 80.0
                                                                                                                         work load gap i: 0
133
           V id: 9
                               li: 9.0
                                                   xi: 4.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 9.0
                                                                                                                             gama i0: 0.0
                                                                                                                                                          gama i1: 1.0
                                                        demand_i: 80.0
                                                                                       work load_i: 80.0
                                                                                                                         work load gap_i: 0
                     duration_time_i: 1.0
           V_id: 10
134
                                 li: 3.0
                                                      xi: 1.5
                                                                          bow of i: 0.0
                                                                                                      tail of i: 3.0
                                                                                                                                gama_i0: 13.0
                                                                                                                                                             gama_i1: 14.
     0
                                                        demand_i: 60.0
                     duration_time_i: 1.0
                                                                                       work load_i: 60.0
                                                                                                                         work load gap_i: 0
135
           V id: 11
                                                                          bow of i: 0.0
                                                                                                      tail of i: 4.0
                                                                                                                                gama i0: 14.0
                                 li: 4.0
                                                      xi: 2.0
                                                                                                                                                            gama i1: 18.
     0
                                                        demand_i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                         work load gap i: 0
                     duration_time_i: 4.0
                                                                          bow of i: 0.0
136
           V id: 12
                                 li: 7.0
                                                      xi: 3.5
                                                                                                      tail of i: 7.0
                                                                                                                                gama i0: 18.0
                                                                                                                                                             gama i1: 21.
     0
                                                        demand_i: 100.0
                     duration_time_i: 3.0
                                                                                       work load_i: 100.0
                                                                                                                         work load gap_i: 0
           V_id: 13
                                                                          bow of i: 0.0
                                                                                                                                gama_i0: 21.0
137
                                                      xi: 3.0
                                                                                                      tail of i: 6.0
                                                                                                                                                             gama_i1: 25.
                                 li: 6.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
     0
                     duration_time_i: 4.0
                                                        demand_i: 160.0
138
139
    Algorithm finished and the total CPU time: 1279 s
140 End
141
```