```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=26137
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   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_7_10 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 = 21
       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] = 17.60 temp_best_value_gen = 17.60
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 17.60 temp_best_value_gen = 17.60
40
     No, maintain solution and obj[gen] = 17.60, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 1.5 4.5 9.5 17. 25.5 28. 4. ]
       second level: [4, 4, 3, 4, 2, 5, 1,]
44
       third level: [2. 1. 2. 8. 2. 2. 8.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 17.60 temp_best_value_gen = 17.60
49
50
     No, maintain solution and obj[gen] = 17.60, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [ 1.5 4.5 9.5 17. 25.5 28. 4. ]
53
       second level: [4. 4. 3. 4. 2. 5. 1.]
54
       third level: [2. 1. 2. 8. 2. 2. 8.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 17.60 temp best value gen = 17.60
59
     No, maintain solution and obj[gen] = 17.60, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [ [ 1.5 4.5 9.5 17. 25.5 28. 4. ]
62
       second level: [4. 4. 3. 4. 2. 5. 1.]
       third level: [2. 1. 2. 8. 2. 2. 8.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 17.60 temp_best_value_gen = 17.60
68
     No, maintain solution and obj[gen] = 17.60, and the tolerance_counter = 4
69
     solution chromosome =
       first level: [ [ 1.5 4.5 9.5 17. 25.5 28. 4. ]
70
       second level: [4. 4. 3. 4. 2. 5. 1.]
71
       third level: [2. 1. 2. 8. 2. 2. 8.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 17.60 temp best value gen = 17.60
76
     No, maintain solution and obj[gen] = 17.60, and the tolerance_counter = 5
77
78
     solution chromosome =
       first level: [ [ 1.5 4.5 9.5 17. 25.5 28. 4. ]
```

```
80
           second level: [4. 4. 3. 4. 2. 5. 1.]
          third level: [2. 1. 2. 8. 2. 2. 8.]]
 81
       The No. 5 iteration is finished!
 82
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 17.60 temp best value gen = 17.60
       No, maintain solution and obj[gen] = 17.60, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [ 1.5 4.5 9.5 17. 25.5 28. 4. ]
          second level: [4, 4, 3, 4, 2, 5, 1,]
 89
 90
          third level: [2. 1. 2. 8. 2. 2. 8.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
       obj[gen-1] = 17.60 temp_best_value_gen = 17.60
 95
       No, maintain solution and obj[gen] = 17.60, and the tolerance_counter = 7
 96
       solution chromosome =
          first level: [ [ 1.5 4.5 9.5 17. 25.5 28. 4. ]
 97
 98
          second level: [4, 4, 3, 4, 2, 5, 1,]
 99
          third level: [2. 1. 2. 8. 2. 2. 8.]]
100
        The No. 7 iteration is finished!
101
102
103
104
    The iteration is terminated and then visulize the solution:
105
       solution chromosome =
          first level: [ [ 1.5 4.5 9.5 17. 25.5 28. 4. ]
106
          second level: [4. 4. 3. 4. 2. 5. 1.] third level: [2. 1. 2. 8. 2. 2. 8.]
107
108
109
        Objective function values and some other indicators:
110
          Obi0 = 7.00
                                 Obj1 = 43.00
                                                        Obj0 + Obj1 = 50.00
          Total movement of crane: 20.00
111
112
          Total waiting time in berth position: 23.00
113
           Total index of q during berthing: 404.00
        Specific arrangement for each vessel:
114
                                                                                                   tail of i: 3.0
                                                                       bow of i: 0.0
                                                                                                                             gama_i0: 4.0
115
           V_id: 0
                              li: 3.0
                                                   xi: 1.5
                                                                                                                                                          gama_i1: 7.0
                    duration_time_i: 3.0
                                                        demand_i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap_i: 0
116
          V_id: 1
                              li: 3.0
                                                   xi: 4.5
                                                                       bow of i: 3.0
                                                                                                   tail of i: 6.0
                                                                                                                             gama i0: 4.0
                                                                                                                                                          gama i1: 8.0
                     duration_time_i: 4.0
                                                        demand\_i{:}\ 80.0
                                                                                                                        work load gap_i: 0
                                                                                       work load_i: 80.0
117
           V_id: 2
                               li: 7.0
                                                   xi: 9.5
                                                                       bow of i: 6.0
                                                                                                    tail of i: 13.0
                                                                                                                                gama_i0: 3.0
                                                                                                                                                            gama_i1: 6.0
                    duration_time_i: 3.0
                                                        demand_i: 100.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
118
           V id: 3
                                                                          bow of i: 13.0
                                                                                                      tail of i: 21.0
                                                                                                                                  gama_i0: 4.0
                              li: 8.0
                                                                                                                                                              gama i1:5
                                                   xi: 17.0
                                                           demand_i: 120.0
                                                                                         work load_i: 120.0
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 1.0
119
           V_id: 4
                               li: 9.0
                                                   xi: 25.5
                                                                          bow of i: 21.0
                                                                                                      tail of i: 30.0
                                                                                                                                  gama_i0: 2.0
                                                                                                                                                               gama_i1: 5
     .0
                       duration_time_i: 3.0
                                                           demand_i: 120.0
                                                                                          work load_i: 120.0
                                                                                                                           work load gap_i: 0
120
                                                                                                      tail of i: 30.0
                                                                                                                                  gama_i0: 5.0
           V_id: 5
                               li: 4.0
                                                   xi: 28.0
                                                                          bow of i: 26.0
                                                                                                                                                               gama_i1: 8
                                                                                                                           work load gap_i: 0
                                                           demand_i: 120.0
                                                                                          work load_i: 120.0
     .0
                       duration_time_i: 3.0
121
           V_id: 6
                               li: 8.0
                                                   xi: 4.0
                                                                       bow of i: 0.0
                                                                                                    tail of i: 8.0
                                                                                                                             gama_i0: 1.0
                                                                                                                                                          gama_i1: 2.0
                                                        demand i: 80.0
                    duration time i: 1.0
                                                                                       work load i: 80.0
                                                                                                                        work load gap_i: 0
122
    Algorithm finished and the total CPU time: 1406 s
123
124 End
125
```