```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=6512
 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_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 = 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] = 65.90 temp_best_value_gen = 65.90
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 65.90 temp_best_value_gen = 65.90
40
     No, maintain solution and obj[gen] = 65.90, and the tolerance_counter = 1
41
42
     solution chromosome =
43
        first level: [ [ 1.5 6. 11. 15.5 20. 24. 27. 2. 4. 2.5 4.5 3.5 2.5 2. ]
        second level: [ 2. 0. 4. 0. 2. 5. 2. 4. 8. 11. 14. 16. 1. 19.]
44
       third level: [2. 4. 2. 2. 4. 2. 4. 2. 3. 2. 5. 3. 4. 3.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 65.90 temp_best_value_gen = 65.90
49
50
     No, maintain solution and obj[gen] = 65.90, and the tolerance_counter = 2
51
     solution chromosome =
52
        first level: [ [ 1.5 6. 11. 15.5 20. 24. 27. 2. 4. 2.5 4.5 3.5 2.5 2. ]
53
        second level: [ 2. 0. 4. 0. 2. 5. 2. 4. 8. 11. 14. 16. 1. 19.]
54
       third level: [2. 4. 2. 2. 4. 2. 4. 2. 3. 2. 5. 3. 4. 3.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 65.90 temp best value gen = 65.90
59
     No, maintain solution and obj[gen] = 65.90, and the tolerance_counter = 3
60
     solution chromosome =
        first level: [ [ 1.5 6. 11. 15.5 20. 24. 27. 2. 4. 2.5 4.5 3.5 2.5 2. ]
61
62
        second level: [ 2. 0. 4. 0. 2. 5. 2. 4. 8. 11. 14. 16. 1. 19.]
       third level: [2. 4. 2. 2. 4. 2. 4. 2. 3. 2. 5. 3. 4. 3.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
     obj[gen-1] = 65.90 temp\_best\_value\_gen = 65.90
67
68
     No, maintain solution and obj[gen] = 65.90, and the tolerance_counter = 4
69
     solution chromosome =
        first level: [ [ 1.5 6. 11. 15.5 20. 24. 27. 2. 4. 2.5 4.5 3.5 2.5 2. ]
70
        second level: [ 2. 0. 4. 0. 2. 5. 2. 4. 8. 11. 14. 16. 1. 19.]
71
        third level: [2. 4. 2. 2. 4. 2. 4. 2. 3. 2. 5. 3. 4. 3.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 65.90 temp best value gen = 65.90
76
     No, maintain solution and obj[gen] = 65.90, and the tolerance_counter = 5
77
78
     solution chromosome =
        first level: [ [ 1.5 6. 11. 15.5 20. 24. 27. 2. 4. 2.5 4.5 3.5 2.5 2. ]
```

```
unknown
  80
           second level: [ 2. 0. 4. 0. 2. 5. 2. 4. 8. 11. 14. 16. 1. 19.]
  81
           third level: [2. 4. 2. 2. 4. 2. 4. 2. 3. 2. 5. 3. 4. 3.]]
  82
         The No. 5 iteration is finished!
  83
      Beging the No. 6 iteration:
  85
        obi[gen-1] = 65.90 temp best value gen = 65.90
        No, maintain solution and obj[gen] = 65.90, and the tolerance_counter = 6
  86
  87
         solution chromosome =
  88
           first level: [ [ 1.5 6. 11. 15.5 20. 24. 27. 2. 4. 2.5 4.5 3.5 2.5 2. ]
  89
           second level: [ 2. 0. 4. 0. 2. 5. 2. 4. 8. 11. 14. 16. 1. 19.]
  90
           third level: [2. 4. 2. 2. 4. 2. 4. 2. 3. 2. 5. 3. 4. 3.]]
  91
         The No. 6 iteration is finished!
  92
  93
      Beging the No. 7 iteration:
  94
         obj[gen-1] = 65.90 temp_best_value_gen = 65.90
  95
         No, maintain solution and obj[gen] = 65.90, and the tolerance_counter = 7
  96
        solution chromosome =
           first level: [[ 1.5 6. 11. 15.5 20. 24. 27. 2. 4. 2.5 4.5 3.5 2.5 2.]
  97
  98
           second level: [2. 0. 4. 0. 2. 5. 2. 4. 8. 11. 14. 16. 1. 19.]
  99
           third level: [2. 4. 2. 2. 4. 2. 4. 2. 3. 2. 5. 3. 4. 3.]]
100
         The No. 7 iteration is finished!
101
102
103
     The iteration is terminated and then visulize the solution:
104
105
         solution chromosome =
106
           first level: [ [ 1.5 6. 11. 15.5 20. 24. 27. 2. 4. 2.5 4.5 3.5 2.5 2. ]
           second level: [ 2. 0. 4. 0. 2. 5. 2. 4. 8. 11. 14. 16. 1. 19.]
107
           third level: [2. 4. 2. 2. 4. 2. 4. 2. 3. 2. 5. 3. 4. 3.]]
108
109
         Objective function values and some other indicators:
110
           Obi0 = 20.00
                                 Obi1 = 279.00
                                                           Obj0 + Obj1 = 299.00
           Total movement of crane: 66.00
111
112
           Total waiting time in berth position: 88.00
           Total index of q during berthing: 557.00
113
114
         Specific arrangement for each vessel:
                                                                                                                            gama_i0: 2.0
115
           V_id: 0
                               1i: 3.0
                                                   xi: 1.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 3.0
                                                                                                                                                        gama_i1: 4.0
                     duration_time_i: 2.0
                                                        demand_i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap_i: 0
           V id: 1
116
                               li: 6.0
                                                   xi: 6.0
                                                                       bow of i: 3.0
                                                                                                   tail of i: 9.0
                                                                                                                            gama i0: 0.0
                                                                                                                                                        gama i1: 1.0
                                                        demand_i: 60.0
                                                                                                                       work load gap_i: 0
                     duration_time_i: 1.0
                                                                                       work load_i: 60.0
117
           V_id: 2
                               li: 4.0
                                                   xi: 11.0
                                                                          bow of i: 9.0
                                                                                                      tail of i: 13.0
                                                                                                                                  gama_i0: 4.0
                                                                                                                                                             gama_i1: 8
                                                                                                                          work load gap_i: 0
                                                                                         work load_i: 140.0
      .0
                        duration_time_i: 4.0
                                                           demand_i: 140.0
118
           V id: 3
                               li: 5.0
                                                                          bow of i: 13.0
                                                                                                      tail of i: 18.0
                                                                                                                                 gama_i0: 0.0
                                                   xi: 15.5
                                                                                                                                                             gama i1:2
                                                           demand_i: 60.0
      .0
                        duration time i: 2.0
                                                                                         work load i: 60.0
                                                                                                                          work load gap_i: 0
119
           V id: 4
                               li: 4.0
                                                   xi: 20.0
                                                                          bow of i: 18.0
                                                                                                      tail of i: 22.0
                                                                                                                                 gama_i0: 2.0
                                                                                                                                                             gama i1:4
      .0
                        duration_time_i: 2.0
                                                           demand_i: 160.0
                                                                                         work load_i: 160.0
                                                                                                                          work load gap_i: 0
120
                                                                                                                                  gama i0: 5.0
           V_id: 5
                               li: 4.0
                                                   xi: 24.0
                                                                          bow of i: 22.0
                                                                                                      tail of i: 26.0
                                                                                                                                                             gama_i1: 9
                                                           demand_i: 140.0
      .0
                        duration_time_i: 4.0
                                                                                         work load_i: 140.0
                                                                                                                          work load gap_i: 0
                                                                          bow of i: 24.0
                                                                                                      tail of i: 30.0
121
           V_id: 6
                               li: 6.0
                                                   xi: 27.0
                                                                                                                                 gama_i0: 2.0
                                                                                                                                                             gama_i1: 4
                        duration time i: 2.0
                                                           demand i: 100.0
                                                                                         work load i: 100.0
                                                                                                                          work load gap i: 0
      .0
122
                                                   xi: 2.0
                                                                       bow of i: 0.0
                                                                                                                                                        gama_i1: 8.0
           V id: 7
                               li: 4.0
                                                                                                   tail of i: 4.0
                                                                                                                            gama i0: 4.0
                     duration time i: 4.0
                                                         demand i: 160.0
                                                                                       work load i: 160.0
                                                                                                                        work load gap i: 0
123
                                                                       bow of i: 0.0
           V_id: 8
                               1i: 8.0
                                                   xi: 4.0
                                                                                                   tail of i: 8.0
                                                                                                                            gama_i0: 8.0
                                                                                                                                                        gama_i1: 11.0
                                                        demand i: 160.0
                     duration_time_i: 3.0
                                                                                       work load i: 160.0
                                                                                                                        work load gap_i: 0
           V_id: 9
124
                                                                        bow of i: 0.0
                               li: 5.0
                                                    xi: 2.5
                                                                                                   tail of i: 5.0
                                                                                                                            gama_i0: 11.0
                                                                                                                                                         gama_i1: 14.0
                     duration_time_i: 3.0
                                                        demand_i: 100.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
125
           V id: 10
                                 1i: 9.0
                                                      xi: 4.5
                                                                          bow of i: 0.0
                                                                                                      tail of i: 9.0
                                                                                                                               gama i0: 14.0
                                                                                                                                                           gama i1: 16.
      0
                     duration time i: 2.0
                                                        demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap_i: 0
126
                                                                          bow of i: 0.0
           V_id: 11
                                 li: 7.0
                                                      xi: 3.5
                                                                                                      tail of i: 7.0
                                                                                                                               gama_i0: 16.0
                                                                                                                                                           gama_i1: 19.
      0
                     duration_time_i: 3.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
           V_id: 12
                                                                          bow of i: 0.0
                                                                                                                               gama_i0: 1.0
127
                                 li: 5.0
                                                      xi: 2.5
                                                                                                      tail of i: 5.0
                                                                                                                                                           gama_i1: 2.0
                     duration_time_i: 1.0
                                                        demand_i: 80.0
                                                                                       work load i: 80.0
                                                                                                                        work load gap_i: 0
                                                                                                                               gama_i0: 19.0
128
           V id: 13
                                 li: 4.0
                                                      xi: 2.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 4.0
                                                                                                                                                           gama i1: 21.
                     duration time i: 2.0
                                                        demand i: 80.0
                                                                                       work load i: 80.0
                                                                                                                        work load gap i: 0
      0
129
130 Algorithm finished and the total CPU time: 1321 s
131 End
132
```