```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=4475
 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_000000/1_000000/2 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_19_8 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 = 57
24
       Iter_num_GA = 300
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] = 84.10 temp_best_value_gen = 84.10
36
     The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
40
     obj[gen-1] = 84.10 temp_best_value_gen = 84.10
41
     No, maintain solution and obj[gen] = 84.10, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [ 4.5 13.5 22. 25.5 4.5 4.5 1.5 2. 3. 4.5 2.5 4.5 3.5 3.5
44
    3. 4. 2. 2.5 4.]
45
       second level: [14. 1. 0. 1. 5. 7. 3. 9. 12. 0. 15. 17. 18. 20. 23. 25. 27. 28.
46
    30.]
47
       third level: [6. 8. 6. 6. 4. 4. 3. 3. 6. 5. 5. 8. 3. 6. 2. 6. 4. 2. 5.]]
48
     The No. 1 iteration is finished!
49
50
   Beging the No. 2 iteration:
51
     obj[gen-1] = 84.10 temp best value gen = 84.10
52
     No, maintain solution and obj[gen] = 84.10, and the tolerance counter = 2
53
     solution chromosome =
54
       first level: [ [ 4.5 13.5 22. 25.5 4.5 4.5 1.5 2. 3. 4.5 2.5 4.5 3.5 3.5
55
    3. 4. 2. 2.5 4.]
56
       second level: [14. 1. 0. 1. 5. 7. 3. 9. 12. 0. 15. 17. 18. 20. 23. 25. 27. 28.
57
    30.]
58
       third level: [6. 8. 6. 6. 4. 4. 3. 3. 6. 5. 5. 8. 3. 6. 2. 6. 4. 2. 5.]]
59
     The No. 2 iteration is finished!
60
   Beging the No. 3 iteration:
61
     obj[gen-1] = 84.10 temp best value gen = 84.10
62
63
     No, maintain solution and obj[gen] = 84.10, and the tolerance_counter = 3
64
     solution chromosome =
       first level: [ [ 4.5 13.5 22. 25.5 4.5 4.5 1.5 2. 3. 4.5 2.5 4.5 3.5 3.5
65
    3. 4. 2. 2.5 4.1
66
67
       second level: [14. 1. 0. 1. 5. 7. 3. 9. 12. 0. 15. 17. 18. 20. 23. 25. 27. 28.
68
    30.]
69
       third level: [6. 8. 6. 6. 4. 4. 3. 3. 6. 5. 5. 8. 3. 6. 2. 6. 4. 2. 5.]]
70
     The No. 3 iteration is finished!
71
   Beging the No. 4 iteration:
73
     obj[gen-1] = 84.10 temp_best_value_gen = 84.10
74
     No, maintain solution and obj[gen] = 84.10, and the tolerance_counter = 4
75
     solution chromosome =
76
       first level: [ [ 4.5 13.5 22. 25.5 4.5 4.5 1.5 2. 3. 4.5 2.5 4.5 3.5 3.5
    3. 4. 2. 2.5 4.1
77
78
       second level: [14. 1. 0. 1. 5. 7. 3. 9. 12. 0. 15. 17. 18. 20. 23. 25. 27. 28.
    30.]
79
```

```
unknown
  80
           third level: [6. 8. 6. 6. 4. 4. 3. 3. 6. 5. 5. 8. 3. 6. 2. 6. 4. 2. 5.]]
  81
         The No. 4 iteration is finished!
  82
  83
      Beging the No. 5 iteration:
        obj[gen-1] = 84.10 temp best value gen = 84.10
  84
  85
        No, maintain solution and obj[gen] = 84.10, and the tolerance_counter = 5
  86
        solution chromosome =
           first level: [ [ 4.5 13.5 22. 25.5 4.5 4.5 1.5 2. 3. 4.5 2.5 4.5 3.5 3.5
  87
  88
       3. 4. 2. 2.5 4.]
  89
           second level: [14. 1. 0. 1. 5. 7. 3. 9. 12. 0. 15. 17. 18. 20. 23. 25. 27. 28.
  90
       30.]
  91
           third level: [6. 8. 6. 6. 4. 4. 3. 3. 6. 5. 5. 8. 3. 6. 2. 6. 4. 2. 5.]]
  92
        The No. 5 iteration is finished!
  93
  94
  95
  96
      The iteration is terminated and then visulize the solution:
  97
        solution chromosome =
  98
           first level: [ [ 4.5 13.5 22. 25.5 4.5 4.5 1.5 2. 3. 4.5 2.5 4.5 3.5 3.5
  99
           4. 2. 2.5 4.]
100
           second\ level;\ [14.\ 1.\ 0.\ 1.\ 5.\ 7.\ 3.\ 9.\ 12.\ 0.\ 15.\ 17.\ 18.\ 20.\ 23.\ 25.\ 27.\ 28.
       30.]
101
102
           third level: [6. 8. 6. 6. 4. 4. 3. 3. 6. 5. 5. 8. 3. 6. 2. 6. 4. 2. 5.]]
        Objective function values and some other indicators:
103
                                                           Obj0 + Obj1 = 301.00
104
           Obi0 = 30.00
                                  Obj1 = 271.00
105
           Total movement of crane: 16.00
           Total waiting time in berth position: 255.00
106
           Total index of q during berthing: 351.00
107
108
         Specific arrangement for each vessel:
109
                               li: 9.0
                                                    xi: 4.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 9.0
                                                                                                                              gama_i0: 14.0
                                                                                                                                                          gama_i1: 15.0
           V_id: 0
                     duration time i: 1.0
                                                         demand i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap i: 0
           V id: 1
110
                               1i: 9.0
                                                                           bow of i: 9.0
                                                                                                                                   gama_i0: 1.0
                                                                                                      tail of i: 18.0
                                                                                                                                                              gama i1:2
                                                    xi: 13.5
      .0
                        duration_time_i: 1.0
                                                           demand_i: 140.0
                                                                                          work load_i: 140.0
                                                                                                                           work load gap_i: 0
111
           V_id: 2
                               1i: 8.0
                                                    xi: 22.0
                                                                           bow of i: 18.0
                                                                                                      tail of i: 26.0
                                                                                                                                   gama_i0: 0.0
                                                                                                                                                               gama_i1: 1
                        duration time i: 1.0
                                                           demand i: 60.0
                                                                                          work load i: 60.0
                                                                                                                           work load gap i: 0
      .0
                               li: 9.0
112
                                                    xi: 25.5
           V_id: 3
                                                                           bow of i: 21.0
                                                                                                      tail of i: 30.0
                                                                                                                                   gama_i0: 1.0
                                                                                                                                                               gama_i1: 2
      .0
                        duration_time_i: 1.0
                                                           demand i: 80.0
                                                                                          work load i: 80.0
                                                                                                                           work load gap_i: 0
113
           V_id: 4
                               li: 9.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 9.0
                                                                                                                             gama i0: 5.0
                                                                                                                                                          gama i1: 7.0
                                                         demand\_i{:}\ 100.0
                                                                                                                         work load gap_i: 0
                     duration_time_i: 2.0
                                                                                        work load_i: 100.0
114
           V_id: 5
                               li: 9.0
                                                    xi: 4.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 9.0
                                                                                                                              gama_i0: 7.0
                                                                                                                                                          gama_i1: 9.0
                                                         demand_i: 160.0
                                                                                        work load_i: 160.0
                     duration_time_i: 2.0
                                                                                                                         work load gap_i: 0
115
           V id: 6
                                                                        bow of i: 0.0
                               li: 3.0
                                                                                                    tail of i: 3.0
                                                                                                                              gama i0: 3.0
                                                                                                                                                          gama i1: 5.0
                                                    xi: 1.5
                                                                                        work load_i: 120.0
                     duration_time_i: 2.0
                                                         demand i: 120.0
                                                                                                                         work load gap_i: 0
116
           V id: 7
                               li: 4.0
                                                    xi: 2.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 4.0
                                                                                                                              gama_i0: 9.0
                                                                                                                                                          gama_i1: 12.0
                     duration_time_i: 3.0
                                                         demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                         work load gap_i: 0
117
           V_id: 8
                               li: 6.0
                                                    xi: 3.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 6.0
                                                                                                                              gama i0: 12.0
                                                                                                                                                          gama_i1: 14.0
                                                         demand_i: 160.0
                     duration_time_i: 2.0
                                                                                        work load_i: 160.0
                                                                                                                         work load gap_i: 0
                                                                        bow of i: 1.0
                                                                                                    tail of i: 8.0
118
           V_id: 9
                               li: 7.0
                                                    xi: 4.5
                                                                                                                             gama_i0: 0.0
                                                                                                                                                          gama_i1: 1.0
                                                                                                                         work load gap_i: 0
                                                         demand i: 60.0
                                                                                       work load i: 60.0
                     duration time i: 1.0
                                                                          bow of i: 0.0
119
           V_id: 10
                                  li: 5.0
                                                      xi: 2.5
                                                                                                      tail of i: 5.0
                                                                                                                                gama_i0: 15.0
                                                                                                                                                            gama_i1: 17.
      0
                     duration time i: 2.0
                                                         demand i: 160.0
                                                                                        work load i: 160.0
                                                                                                                         work load gap i: 0
120
                                                                           bow of i: 0.0
                                                                                                       tail of i: 9.0
           V_id: 11
                                  1i: 9.0
                                                      xi: 4.5
                                                                                                                                gama_i0: 17.0
                                                                                                                                                            gama_i1: 18.
      0
                                                         demand i: 100.0
                                                                                                                         work load gap_i: 0
                     duration time i: 1.0
                                                                                       work load i: 100.0
                                                                           bow of i: 0.0
121
           V_id: 12
                                  li: 7.0
                                                       xi: 3.5
                                                                                                       tail of i: 7.0
                                                                                                                                gama_i0: 18.0
                                                                                                                                                            gama_i1: 20.
      0
                                                         demand_i: 120.0
                                                                                        work load i: 120.0
                                                                                                                         work load gap_i: 0
                     duration time i: 2.0
122
           V id: 13
                                                      xi: 3.5
                                                                           bow of i: 0.0
                                                                                                      tail of i: 7.0
                                                                                                                                gama i0: 20.0
                                                                                                                                                            gama i1: 22.
                                  li: 7.0
      0
                     duration time i: 2.0
                                                         demand_i: 160.0
                                                                                       work load i: 160.0
                                                                                                                         work load gap_i: 0
123
                                                                           bow of i: 0.0
           V_id: 14
                                  li: 6.0
                                                      xi: 3.0
                                                                                                       tail of i: 6.0
                                                                                                                                gama_i0: 23.0
                                                                                                                                                            gama_i1: 25.
      0
                     duration_time_i: 2.0
                                                         demand_i: 80.0
                                                                                        work load_i: 80.0
                                                                                                                         work load gap_i: 0
           V_id: 15
                                                                                                                                gama_i0: 25.0
124
                                                                           bow of i: 0.0
                                 li: 8.0
                                                      xi: 4.0
                                                                                                      tail of i: 8.0
                                                                                                                                                            gama_i1: 27.
                                                                                                                         work load gap_i: 0
      0
                     duration_time_i: 2.0
                                                         demand_i: 140.0
                                                                                       work load i: 140.0
125
           V id: 16
                                  li: 4.0
                                                      xi: 2.0
                                                                           bow of i: 0.0
                                                                                                      tail of i: 4.0
                                                                                                                                gama i0: 27.0
                                                                                                                                                            gama i1: 28.
                                                         demand i: 80.0
                                                                                       work load_i: 80.0
      0
                     duration time i: 1.0
                                                                                                                         work load gap i: 0
126
           V_id: 17
                                                                           bow of i: 0.0
                                                                                                      tail of i: 5.0
                                                                                                                                gama_i0: 28.0
                                 li: 5.0
                                                      xi: 2.5
                                                                                                                                                            gama i1: 30.
      0
                     duration_time_i: 2.0
                                                         demand_i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                         work load gap_i: 0
127
           V id: 18
                                  li: 8.0
                                                                           bow of i: 0.0
                                                                                                      tail of i: 8.0
                                                                                                                                gama_i0: 30.0
                                                      xi: 4.0
                                                                                                                                                            gama_i1: 31.
                                                                                       work load i: 60.0
      0
                     duration time i: 1.0
                                                         demand i: 60.0
                                                                                                                         work load gap_i: 0
128
129
      Algorithm finished and the total CPU time: 1242 s
130
131
```