```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=45002
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_13_9 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 = 39
       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] = 55.90 temp_best_value_gen = 55.90
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 55.90 temp_best_value_gen = 55.90
40
     No, maintain solution and obj[gen] = 55.90, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [[3. 10. 18. 26. 27. 3.5 2. 4.5 4. 3.5 4.5 3.5 4.5]
       second level: [5. 2. 3. 4. 6. 7. 1. 10. 0. 4. 12. 14. 17.]
44
       third level: [4. 6. 3. 6. 2. 2. 2. 6. 6. 4. 6. 3. 7.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 55.90 temp_best_value_gen = 55.90
49
50
     No, maintain solution and obj[gen] = 55.90, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [ 3. 10. 18. 26. 27. 3.5 2. 4.5 4. 3.5 4.5 3.5 4.5 ]
       second level: [5. 2. 3. 4. 6. 7. 1. 10. 0. 4. 12. 14. 17.]
53
54
       third level: [4. 6. 3. 6. 2. 2. 2. 6. 6. 4. 6. 3. 7.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 55.90 temp best value gen = 55.90
59
     No, maintain solution and obj[gen] = 55.90, and the tolerance_counter = 3
60
     solution chromosome =
       first level: [[3. 10. 18. 26. 27. 3.5 2. 4.5 4. 3.5 4.5 3.5 4.5]
61
62
       second level: [5. 2. 3. 4. 6. 7. 1. 10. 0. 4. 12. 14. 17.]
       third level: [4. 6. 3. 6. 2. 2. 2. 6. 6. 4. 6. 3. 7.]]
63
64
     The No. 3 iteration is finished!
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 55.90 temp_best_value_gen = 55.90
68
     No, maintain solution and obj[gen] = 55.90, and the tolerance_counter = 4
69
     solution chromosome =
70
       first level: [ [ 3. 10. 18. 26. 27. 3.5 2. 4.5 4. 3.5 4.5 3.5 4.5]
       second level: [5. 2. 3. 4. 6. 7. 1. 10. 0. 4. 12. 14. 17.]
71
       third level: [4. 6. 3. 6. 2. 2. 2. 6. 6. 4. 6. 3. 7.]]
73
     The No. 4 iteration is finished!
74
75
  Beging the No. 5 iteration:
     obi[gen-1] = 55.90 temp best value gen = 55.90
76
     No, maintain solution and obj[gen] = 55.90, and the tolerance_counter = 5
77
     solution chromosome =
78
       first level: [ [ 3. 10. 18. 26. 27. 3.5 2. 4.5 4. 3.5 4.5 3.5 4.5]
```

```
unknown
  80
           second level: [ 5. 2. 3. 4. 6. 7. 1. 10. 0. 4. 12. 14. 17.]
  81
           third level: [4. 6. 3. 6. 2. 2. 2. 6. 6. 4. 6. 3. 7.]]
  82
         The No. 5 iteration is finished!
  83
      Beging the No. 6 iteration:
  85
        obj[gen-1] = 55.90 temp best value gen = 55.90
        No, maintain solution and obj[gen] = \overline{55.90}, and the tolerance_counter = 6
  86
  87
         solution chromosome =
  88
           first level: [ [ 3. 10. 18. 26. 27. 3.5 2. 4.5 4. 3.5 4.5 3.5 4.5]
           second level: [5. 2. 3. 4. 6. 7. 1. 10. 0. 4. 12. 14. 17.]
  89
  90
           third level: [4. 6. 3. 6. 2. 2. 2. 6. 6. 4. 6. 3. 7.]]
  91
         The No. 6 iteration is finished!
  92
  93
      Beging the No. 7 iteration:
  94
         obj[gen-1] = 55.90 temp_best_value_gen = 55.90
  95
         No, maintain solution and obj[gen] = 55.90, and the tolerance_counter = 7
  96
        solution chromosome =
  97
           first level: [ [ 3. 10. 18. 26. 27. 3.5 2. 4.5 4. 3.5 4.5 3.5 4.5]
  98
           second level: [5. 2. 3. 4. 6. 7. 1. 10. 0. 4. 12. 14. 17.]
 99
           third level: [4. 6. 3. 6. 2. 2. 2. 6. 6. 4. 6. 3. 7.]]
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: [ [ 3. 10. 18. 26. 27. 3.5 2. 4.5 4. 3.5 4.5 3.5 4.5 ]
           second level: [5. 2. 3. 4. 6. 7. 1. 10. 0. 4. 12. 14. 17.]
107
           third level: [4. 6. 3. 6. 2. 2. 2. 6. 6. 4. 6. 3. 7.]]
108
109
         Objective function values and some other indicators:
110
           Obi0 = 17.00
                                 Obj1 = 236.00
                                                           Obj0 + Obj1 = 253.00
           Total movement of crane: 60.00
111
112
           Total waiting time in berth position: 85.00
           Total index of q during berthing: 542.00
113
114
         Specific arrangement for each vessel:
115
                                                                                                                             gama_i0: 5.0
           V_id: 0
                               li: 6.0
                                                   xi: 3.0
                                                                        bow of i: 0.0
                                                                                                   tail of i: 6.0
                                                                                                                                                         gama_i1: 7.0
                     duration_time_i: 2.0
                                                        demand_i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap_i: 0
           V id: 1
116
                               li: 8.0
                                                   xi: 10.0
                                                                          bow of i: 6.0
                                                                                                      tail of i: 14.0
                                                                                                                                  gama i0: 2.0
                                                                                                                                                             gama_i1: 3
                                                           demand_i: 80.0
      .0
                        duration_time_i: 1.0
                                                                                         work load i: 80.0
                                                                                                                          work load gap_i: 0
117
           V_id: 2
                               li: 8.0
                                                    xi: 18.0
                                                                          bow of i: 14.0
                                                                                                      tail of i: 22.0
                                                                                                                                  gama_i0: 3.0
                                                                                                                                                              gama_i1: 6
                                                                                                                          work load gap_i: 0
                                                                                         work load_i: 140.0
      .0
                        duration_time_i: 3.0
                                                           demand_i: 140.0
118
           V id: 3
                               li: 8.0
                                                   xi: 26.0
                                                                          bow of i: 22.0
                                                                                                      tail of i: 30.0
                                                                                                                                  gama_i0: 4.0
                                                                                                                                                              gama i1:6
                        duration_time_i: 2.0
                                                                                                                          work load gap_i: 0
      .0
                                                           demand i: 160.0
                                                                                         work load i: 160.0
119
           V_id: 4
                               li: 6.0
                                                    xi: 27.0
                                                                          bow of i: 24.0
                                                                                                      tail of i: 30.0
                                                                                                                                  gama_i0: 6.0
                                                                                                                                                              gama_i1:
      10.0
                          duration_time_i: 4.0
                                                             demand_i: 160.0
                                                                                            work load_i: 160.0
                                                                                                                             work load gap_i: 0
120
                                                                                                                             gama_i0: 7.0
           V_id: 5
                               li: 7.0
                                                   xi: 3.5
                                                                        bow of i: 0.0
                                                                                                   tail of i: 7.0
                                                                                                                                                         gama_i1: 10.0
                                                        demand\_i{:}\ 100.0
                     duration_time_i: 3.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
                                                                        bow of i: 0.0
                                                                                                   tail of i: 4.0
121
           V_id: 6
                               li: 4.0
                                                    xi: 2.0
                                                                                                                            gama_i0: 1.0
                                                                                                                                                         gama_i1: 4.0
                     duration time i: 3.0
                                                        demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap_i: 0
           V_id: 7
122
                                                                                                                             gama_i0: 10.0
                               li: 9.0
                                                    xi: 4.5
                                                                        bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                                                         gama_i1: 12.0
                     duration time i: 2.0
                                                         demand i: 140.0
                                                                                       work load i: 140.0
                                                                                                                        work load gap i: 0
123
           V_id: 8
                               1i: 8.0
                                                    xi: 4.0
                                                                        bow of i: 0.0
                                                                                                   tail of i: 8.0
                                                                                                                            gama_i0: 0.0
                                                                                                                                                         gama_i1: 1.0
                                                        demand i: 80.0
                     duration_time_i: 1.0
                                                                                       work load_i: 80.0
                                                                                                                        work load gap_i: 0
           V_id: 9
124
                                                                        bow of i: 0.0
                               li: 7.0
                                                    xi: 3.5
                                                                                                   tail of i: 7.0
                                                                                                                             gama_i0: 4.0
                                                                                                                                                         gama_i1: 5.0
                     duration_time_i: 1.0
                                                        demand_i: 80.0
                                                                                       work load_i: 80.0
                                                                                                                        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: 12.0
                                                                                                                                                           gama i1: 14.
      0
                     duration time i: 2.0
                                                        demand i: 160.0
                                                                                       work load i: 160.0
                                                                                                                        work load gap_i: 0
126
                                                      xi: 3.5
                                                                          bow of i: 0.0
           V_id: 11
                                 li: 7.0
                                                                                                      tail of i: 7.0
                                                                                                                               gama_i0: 14.0
                                                                                                                                                           gama_i1: 17.
                                                        demand_i: 140.0
      0
                     duration_time_i: 3.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
                                                                                                                               gama_i0: 17.0
127
           V id: 12
                                 li: 9.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 9.0
                                                      xi: 4.5
                                                                                                                                                           gama i1: 18.
                     duration_time_i: 1.0
      0
                                                        demand_i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap_i: 0
128
     Algorithm finished and the total CPU time: 1271 s
129
130 End
131
```