```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=43612
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_7 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] = 63.50 temp_best_value_gen = 63.50
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 63.50 temp_best_value_gen = 63.50
40
     No, maintain solution and obj[gen] = \overline{63.50}, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 4.5 11. 14.5 19.5 25.5 4.5 2. 2.5 4. 3. 3. 2.5 1.5]
44
       second level: [6. 1. 0. 3. 4. 0. 7. 1. 4. 11. 15. 17. 20.]
       third level: [7. 2. 3. 7. 2. 7. 2. 2. 6. 2. 6. 3. 2.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
49
     obj[gen-1] = 63.50 temp_best_value_gen = 63.50
50
     No, maintain solution and obj[gen] = 63.50, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [ 4.5 11. 14.5 19.5 25.5 4.5 2. 2.5 4. 3. 3. 2.5 1.5]
53
       second level: [ 6. 1. 0. 3. 4. 0. 7. 1. 4. 11. 15. 17. 20.]
54
       third level: [7. 2. 3. 7. 2. 7. 2. 2. 6. 2. 6. 3. 2.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 63.50 temp best value gen = 58.40
59
     Yes, update solution and obj[gen] = 58.40
60
     solution chromosome =
       first level: [ [ 4.5 11. 1.5 19.5 25.5 4.5 2.5 2.5 4. 3. 3. 2.5 14.5]
61
62
       second level: [ 6. 1. 20. 3. 4. 0. 1. 7. 9. 11. 15. 17. 0.]
       third level: [7. 2. 2. 7. 2. 7. 2. 6. 2. 6. 3. 3.]]
63
64
     The No. 3 iteration is finished!
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 58.40 temp\_best\_value\_gen = 58.40
68
     No, maintain solution and obj[gen] = 58.40, and the tolerance_counter = 1
69
     solution chromosome =
70
       first level: [ [ 4.5 11. 1.5 19.5 25.5 4.5 2.5 2.5 4. 3. 3. 2.5 14.5]
       second level: [6. 1. 20. 3. 4. 0. 1. 7. 9. 11. 15. 17. 0.]
71
       third level: [7. 2. 2. 7. 2. 7. 2. 2. 6. 2. 6. 3. 3.]]
73
     The No. 4 iteration is finished!
74
75
  Beging the No. 5 iteration:
     obi[gen-1] = 58.40 temp best value gen = 58.40
76
     No, maintain solution and obj[gen] = 58.40, and the tolerance_counter = 2
77
78
     solution chromosome =
```

```
80
          second level: [ 6. 1. 20. 3. 4. 0. 1. 7. 9. 11. 15. 17. 0.]
 81
          third level: [7. 2. 2. 7. 2. 7. 2. 6. 2. 6. 3. 3.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 84
 85
       obj[gen-1] = 58.40 temp best value gen = 58.40
       No, maintain solution and obj[gen] = \overline{58.40}, and the tolerance_counter = 3
 86
 87
       solution chromosome =
          first level: [ [ 4.5 11. 1.5 19.5 25.5 4.5 2.5 2.5 4. 3. 3. 2.5 14.5]
 88
          second level: [ 6. 1. 20. 3. 4. 0. 1. 7. 9. 11. 15. 17. 0.]
 89
 90
          third level: [7. 2. 2. 7. 2. 7. 2. 2. 6. 2. 6. 3. 3.]]
 91
       The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
       obj[gen-1] = 58.40 temp\_best\_value\_gen = 58.40
 95
       No, maintain solution and obj[gen] = 58.40, and the tolerance_counter = 4
 96
       solution chromosome =
 97
          first level: [ [ 4.5 11. 1.5 19.5 25.5 4.5 2.5 2.5 4. 3. 3. 2.5 14.5]
          second level: [ 6. 1. 20. 3. 4. 0. 1. 7. 9. 11. 15. 17. 0.]
 98
99
          third level: [7. 2. 2. 7. 2. 7. 2. 2. 6. 2. 6. 3. 3.]]
100
       The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
       obi[gen-1] = 58.40 temp best value gen = 58.40
103
       No, maintain solution and obj[gen] = 58.40, and the tolerance_counter = 5
104
105
       solution chromosome =
          106
107
          second level: [ 6. 1. 20. 3. 4. 0. 1. 7. 9. 11. 15. 17. 0.]
          third level: [7. 2. 2. 7. 2. 7. 2. 2. 6. 2. 6. 3. 3.]]
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 11. 1.5 19.5 25.5 4.5 2.5 2.5 4. 3. 3. 2.5 14.5]
115
          second level: [ 6. 1. 20. 3. 4. 0. 1. 7. 9. 11. 15. 17. 0.]
116
          third level: [7. 2. 2. 7. 2. 7. 2. 2. 6. 2. 6. 3. 3.]]
117
       Objective function values and some other indicators:
118
                                                         Obj0 + Obj1 = 188.00
119
          Obi0 = 22.00
                                Obj1 = 166.00
120
          Total movement of crane: 23.00
121
          Total waiting time in berth position: 94.00
122
          Total index of q during berthing: 468.00
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: 6.0
                                                                                                                                                     gama_i1: 7.0
                    duration_time_i: 1.0
                                                       demand i: 140.0
                                                                                     work load_i: 140.0
                                                                                                                     work load gap i: 0
125
          V_id: 1
                                                                        bow of i: 9.0
                             li: 4.0
                                                  xi: 11.0
                                                                                                   tail of i: 13.0
                                                                                                                               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: 2
126
                                                                                                 tail of i: 3.0
                                                                                                                          gama i0: 20.0
                                                                                                                                                     gama i1: 23.0
                             li: 3.0
                                                                     bow of i: 0.0
                                                                                     work load_i: 100.0
                                                                                                                     work load gap_i: 0
                    duration time i: 3.0
                                                       demand i: 100.0
127
          V id: 3
                              li: 7.0
                                                  xi: 19.5
                                                                        bow of i: 16.0
                                                                                                   tail of i: 23.0
                                                                                                                               gama i0: 3.0
                                                                                                                                                          gama il: 4
                                                                                       work load_i: 60.0
                                                                                                                       work load gap_i: 0
     .0
                      duration_time_i: 1.0
                                                         demand_i: 60.0
128
          V id: 4
                             li: 9.0
                                                                        bow of i: 21.0
                                                                                                   tail of i: 30.0
                                                  xi: 25.5
                                                                                                                               gama i0: 4.0
                                                                                                                                                          gama i1:8
                                                                                       work load i: 160.0
                      duration_time_i: 4.0
                                                         demand_i: 160.0
                                                                                                                       work load gap_i: 0
129
          V_id: 5
                              li: 9.0
                                                  xi: 4.5
                                                                      bow of i: 0.0
                                                                                                 tail of i: 9.0
                                                                                                                          gama_i0: 0.0
                                                                                                                                                     gama_i1: 1.0
                    duration time i: 1.0
                                                       demand i: 140.0
                                                                                     work load i: 140.0
                                                                                                                     work load gap i: 0
                                                                     bow of i: 0.5
130
          V id: 6
                              li: 4.0
                                                  xi: 2.5
                                                                                                 tail of i: 4.5
                                                                                                                          gama i0: 1.0
                                                                                                                                                     gama i1: 5.0
                    duration_time_i: 4.0
                                                       demand_i: 160.0
                                                                                     work load_i: 160.0
                                                                                                                     work load gap_i: 0
                                                                      bow of i: 0.0
131
          V_id: 7
                              li: 5.0
                                                  xi: 2.5
                                                                                                 tail of i: 5.0
                                                                                                                          gama_i0: 7.0
                                                                                                                                                     gama_i1: 9.0
                    duration_time_i: 2.0
                                                       demand i: 60.0
                                                                                                                     work load gap_i: 0
                                                                                     work load i: 60.0
                                                                                                                          gama_i0: 9.0
132
          V id: 8
                              1i: 8.0
                                                  xi: 4.0
                                                                     bow of i: 0.0
                                                                                                 tail of i: 8.0
                                                                                                                                                     gama_i1: 11.0
                    duration time i: 2.0
                                                       demand i: 160.0
                                                                                     work load i: 160.0
                                                                                                                     work load gap i: 0
133
          V id: 9
                              li: 6.0
                                                                      bow of i: 0.0
                                                                                                 tail of i: 6.0
                                                                                                                          gama i0: 11.0
                                                                                                                                                     gama i1: 15.0
                    duration_time_i: 4.0
                                                      demand_i: 160.0
                                                                                     work load_i: 160.0
                                                                                                                     work load gap_i: 0
          V_id: 10
134
                                li: 6.0
                                                     xi: 3.0
                                                                        bow of i: 0.0
                                                                                                   tail of i: 6.0
                                                                                                                            gama_i0: 15.0
                                                                                                                                                        gama_i1: 17.
     0
                                                       demand i: 160.0
                                                                                     work load_i: 160.0
                                                                                                                     work load gap_i: 0
                    duration_time_i: 2.0
135
          V id: 11
                                1i: 5.0
                                                    xi: 2.5
                                                                        bow of i: 0.0
                                                                                                   tail of i: 5.0
                                                                                                                            gama i0: 17.0
                                                                                                                                                        gama i1: 20.
     0
                                                      demand_i: 140.0
                                                                                    work load_i: 140.0
                                                                                                                     work load gap_i: 0
                    duration_time_i: 3.0
                                                                                                                                 gama_i0: 0.0
          V_id: 12
136
                                li: 3.0
                                                                          bow of i: 13.0
                                                                                                      tail of i: 16.0
                                                                                                                                                             gama il
                         duration_time_i: 3.0
                                                            demand_i: 140.0
                                                                                         work load_i: 140.0
                                                                                                                          work load gap_i: 0
     : 3.0
137
     Algorithm finished and the total CPU time: 1208 s
138
139
    End
140
```