```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=51265
 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_12_2 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 = 36
       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] = 60.50 temp_best_value_gen = 60.50
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 60.50 temp_best_value_gen = 60.50
40
     No, maintain solution and obj[gen] = 60.50, and the tolerance_counter = 1
41
42
     solution chromosome =
       first level: [ [ 3. 7.5 13.5 21.5 27.5 3.5 2. 2.5 26.5 2.5 2.5 4. ] second level: [ 2. 3. 3. 1. 8. 16. 6. 12. 2. 17. 9. 20.]
43
44
       third level: [2. 2. 8. 7. 4. 7. 3. 2. 4. 5. 4. 7.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 60.50 temp_best_value_gen = 60.50
49
50
     No, maintain solution and obj[gen] = 60.50, and the tolerance_counter = 2
51
     solution chromosome =
52
        first level: [ [ 3. 7.5 13.5 21.5 27.5 3.5 2. 2.5 26.5 2.5 2.5 4. ]
        second level: [2. 3. 3. 1. 8. 16. 6. 12. 2. 17. 9. 20.]
53
54
       third level: [2. 2. 8. 7. 4. 7. 3. 2. 4. 5. 4. 7.]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 60.50 temp best value gen = 60.50
59
     No, maintain solution and obj[gen] = 60.50, and the tolerance_counter = 3
60
     solution chromosome =
        first level: [[ 3. 7.5 13.5 21.5 27.5 3.5 2. 2.5 26.5 2.5 2.5 4.]
61
       second level: [2. 3. 3. 1. 8. 16. 6. 12. 2. 17. 9. 20.] third level: [2. 2. 8. 7. 4. 7. 3. 2. 4. 5. 4. 7.]]
62
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 60.50 temp_best_value_gen = 60.50
68
     No, maintain solution and obj[gen] = 60.50, and the tolerance_counter = 4
69
     solution chromosome =
       first level: [ [ 3. \, 7.5 | 13.5 | 21.5 | 27.5 | 3.5 | 2. \, 2.5 | 26.5 | 2.5 | 2.5 | 4. ] second level: [ 2. 3. 3. 1. 8. 16. 6. 12. 2. 17. 9. 20.]
70
71
        third level: [2. 2. 8. 7. 4. 7. 3. 2. 4. 5. 4. 7.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 60.50 temp best value gen = 60.50
76
     No, maintain solution and obj[gen] = 60.50, and the tolerance_counter = 5
77
78
     solution chromosome =
        first level: [ [ 3. 7.5 13.5 21.5 27.5 3.5 2. 2.5 26.5 2.5 2.5 4. ]
```

```
second level: [ 2. 3. 3. 1. 8. 16. 6. 12. 2. 17. 9. 20.]
 80
 81
          third level: [2. 2. 8. 7. 4. 7. 3. 2. 4. 5. 4. 7.]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 84
 85
        obj[gen-1] = 60.50 temp best value gen = 60.50
        No, maintain solution and obj[gen] = 60.50, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [ 3. 7.5 13.5 21.5 27.5 3.5 2. 2.5 26.5 2.5 2.5 4. ]
 89
          second level: [2. 3. 3. 1. 8. 16. 6. 12. 2. 17. 9. 20.]
 90
          third level: [2. 2. 8. 7. 4. 7. 3. 2. 4. 5. 4. 7.]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 60.50 temp_best_value_gen = 60.50
 95
        No, maintain solution and obj[gen] = 60.50, and the tolerance_counter = 7
 96
        solution chromosome =
 97
          first level: [ [ 3. 7.5 13.5 21.5 27.5 3.5 2. 2.5 26.5 2.5 2.5 4. ]
 98
           second level: [2. 3. 3. 1. 8. 16. 6. 12. 2. 17. 9. 20.]
 99
          third level: [2. 2. 8. 7. 4. 7. 3. 2. 4. 5. 4. 7.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
103
        obi[gen-1] = 60.50 temp best value gen = 60.50
        No, maintain solution and obj[\overline{gen}] = \overline{60.50}, and the tolerance_counter = 8
104
105
        solution chromosome =
          first level: [ [ 3. 7.5 13.5 21.5 27.5 3.5 2. 2.5 26.5 2.5 2.5 4. ]
106
          second level: [2. 3. 3. 1. 8. 16. 6. 12. 2. 17. 9. 20.] third level: [2. 2. 8. 7. 4. 7. 3. 2. 4. 5. 4. 7.]]
107
108
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 60.50 temp_best_value_gen = 60.50
        No, maintain solution and obj[gen] = 60.50, and the tolerance_counter = 9
113
114
        solution chromosome =
           first level: [[3. 7.5 13.5 21.5 27.5 3.5 2. 2.5 26.5 2.5 2.5 4.]
115
116
           second level: [2. 3. 3. 1. 8. 16. 6. 12. 2. 17. 9. 20.]
          third level: [2. 2. 8. 7. 4. 7. 3. 2. 4. 5. 4. 7.]]
117
118
        The No. 9 iteration is finished!
119
120
121
     The iteration is terminated and then visulize the solution:
122
123
        solution chromosome =
          first level: [ [ 3. 7.5 13.5 21.5 27.5 3.5 2. 2.5 26.5 2.5 2.5 4. ]
124
125
          second level: [2. 3. 3. 1. 8. 16. 6. 12. 2. 17. 9. 20.]
          third level: [2. 2. 8. 7. 4. 7. 3. 2. 4. 5. 4. 7.]
126
127
        Objective function values and some other indicators:
                                 Obj1 = 206.00
128
          Obi0 = 21.00
                                                           Obj0 + Obj1 = 227.00
129
           Total movement of crane: 58.00
           Total waiting time in berth position: 99.00
130
          Total index of q during berthing: 543.00
131
        Specific arrangement for each vessel:
132
                                                   xi: 3.0
                                                                                                                              gama i0: 2.0
133
           V_id: 0
                               1i: 6.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 6.0
                                                                                                                                                          gama_i1: 6.0
                     duration_time_i: 4.0
                                                        demand_i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
134
           V id: 1
                               li: 3.0
                                                   xi: 7.5
                                                                        bow of i: 6.0
                                                                                                    tail of i: 9.0
                                                                                                                             gama i0: 3.0
                                                                                                                                                          gama i1: 5.0
                     duration time i: 2.0
                                                        demand i: 80.0
                                                                                       work load i: 80.0
                                                                                                                        work load gap i: 0
135
                                                                          bow of i: 9.0
           V_id: 2
                               li: 9.0
                                                   xi: 13.5
                                                                                                      tail of i: 18.0
                                                                                                                                  gama_i0: 3.0
                                                                                                                                                               gama_i1: 4
     .0
                       duration_time_i: 1.0
                                                           demand_i: 60.0
                                                                                          work load_i: 60.0
                                                                                                                           work load gap_i: 0
136
           V_id: 3
                                                                          bow of i: 18.0
                                                                                                      tail of i: 25.0
                                                                                                                                  gama i0: 1.0
                               li: 7.0
                                                   xi: 21.5
                                                                                                                                                               gama_i1: 2
      .0
                       duration_time_i: 1.0
                                                           demand_i: 120.0
                                                                                          work load_i: 120.0
                                                                                                                           work load gap_i: 0
                                                                                                                                   gama_i0: 8.0
137
           V_id: 4
                               li: 5.0
                                                   xi: 27.5
                                                                          bow of i: 25.0
                                                                                                      tail of i: 30.0
                                                                                                                                                               gama i1:
                                                                                            work load i: 160.0
                                                                                                                              work load gap i: 0
     10.0
                          duration time i: 2.0
                                                             demand i: 160.0
138
           V_id: 5
                                                   xi: 3.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 7.0
                                                                                                                             gama_i0: 16.0
                                                                                                                                                          gama_i1: 17.0
                               li: 7.0
                     duration_time_i: 1.0
                                                        demand_i: 80.0
                                                                                       work load_i: 80.0
                                                                                                                        work load gap_i: 0
139
           V_id: 6
                                                   xi: 2.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 4.0
                                                                                                                             gama_i0: 6.0
                               li: 4.0
                                                                                                                                                          gama_i1: 9.0
                     duration time i: 3.0
                                                        demand i: 140.0
                                                                                       work load i: 140.0
                                                                                                                        work load gap i: 0
140
           V id: 7
                               li: 5.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 5.0
                                                                                                                             gama i0: 12.0
                                                                                                                                                          gama_i1: 16.0
                                                   xi: 2.5
                     duration_time_i: 4.0
                                                        demand i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
141
           V_id: 8
                                                                          bow of i: 23.0
                                                                                                      tail of i: 30.0
                               li: 7.0
                                                   xi: 26.5
                                                                                                                                  gama_i0: 2.0
                                                                                                                                                               gama_i1: 4
                                                                                         work load i: 140.0
                                                                                                                           work load gap_i: 0
                       duration time i: 2.0
                                                           demand_i: 140.0
     .0
142
                                                   xi: 2.5
           V_id: 9
                               li: 5.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 5.0
                                                                                                                              gama_i0: 17.0
                                                                                                                                                          gama_i1: 19.0
                                                                                       work load_i: 160.0
                     duration\_time\_i{:}~2.0
                                                        demand_i: 160.0
                                                                                                                        work load gap_i: 0
                                                      xi: 2.5
143
           V id: 10
                                 li: 5.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 5.0
                                                                                                                                gama i0: 9.0
                                                                                                                                                            gama_i1: 11.
     0
                                                        demand i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
                     duration_time_i: 2.0
144
           V id: 11
                                 li: 8.0
                                                      xi: 4.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 8.0
                                                                                                                                gama i0: 20.0
                                                                                                                                                            gama i1: 22.
     0
                     duration_time_i: 2.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
145
146 Algorithm finished and the total CPU time: 1201 s
147 End
148
```