```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=42917
 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'])
 5
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_6_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 = 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] = 62.80 temp_best_value_gen = 62.80
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 62.80 temp_best_value_gen = 62.80
40
     No, maintain solution and obj[gen] = \overline{62.80}, and the tolerance_counter = 1
41
42
     solution chromosome =
43
        first level: [[ 2. 8. 16. 24. 28. 2.5 4. 1.5 3.5 3.5 2. 4.5 3.]
        second level: [1. 5. 6. 3. 7. 3. 7. 5. 9. 2. 12. 15. 19.]
44
       third level: [4. 4. 2. 2. 3. 3. 2. 3. 2. 4. 2. 2. 2.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
49
     obj[gen-1] = 62.80 temp_best_value_gen = 62.80
50
     No, maintain solution and obj[gen] = 62.80, and the tolerance_counter = 2
51
     solution chromosome =
        first level: [ [ 2. 8. 16. 24. 28. 2.5 4. 1.5 3.5 3.5 2. 4.5 3. ]
52
        second level: [1. 5. 6. 3. 7. 3. 7. 5. 9. 2. 12. 15. 19.]
53
54
       third level: [4. 4. 2. 2. 3. 3. 2. 3. 2. 4. 2. 2. 2.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 62.80 temp best value gen = 62.80
59
     No, maintain solution and obj[gen] = 62.80, and the tolerance_counter = 3
60
     solution chromosome =
        first level: [[ 2. 8. 16. 24. 28. 2.5 4. 1.5 3.5 3.5 2. 4.5 3.]
61
        second level: [1, 5, 6, 3, 7, 3, 7, 5, 9, 2, 12, 15, 19,]
62
       third level: [4. 4. 2. 2. 3. 3. 2. 3. 2. 4. 2. 2. 2.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 62.80 temp_best_value_gen = 62.80
68
     No, maintain solution and obj[gen] = 62.80, and the tolerance_counter = 4
69
     solution chromosome =
70
        first\ level: \hbox{\tt [[2.\ 8.\ 16.\ 24.\ 28.\ 2.5\ 4.\ 1.5\ 3.5\ 3.5\ 2.\ 4.5\ 3.]}
        second level: [1. 5. 6. 3. 7. 3. 7. 5. 9. 2. 12. 15. 19.]
71
       third level: [4. 4. 2. 2. 3. 3. 2. 3. 2. 4. 2. 2. 2.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 62.80 temp best value gen = 62.80
76
     No, maintain solution and obj[gen] = 62.80, and the tolerance_counter = 5
77
78
     solution chromosome =
        first level: [ [ 2. 8. 16. 24. 28. 2.5 4. 1.5 3.5 3.5 2. 4.5 3. ]
79
```

```
80
           second level: [ 1. 5. 6. 3. 7. 3. 7. 5. 9. 2. 12. 15. 19.]
 81
          third level: [4. 4. 2. 2. 3. 3. 2. 3. 2. 4. 2. 2. 2.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 84
 85
        obj[gen-1] = 62.80 temp best value gen = 62.80
        No, maintain solution and obj[gen] = \overline{62.80}, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [ 2. 8. 16. 24. 28. 2.5 4. 1.5 3.5 3.5 2. 4.5 3. ]
          second level: [1. 5. 6. 3. 7. 3. 7. 5. 9. 2. 12. 15. 19.]
 89
 90
          third level: [4. 4. 2. 2. 3. 3. 2. 3. 2. 4. 2. 2. 2.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 62.80 temp\_best\_value\_gen = 62.80
 95
        No, maintain solution and obj[gen] = 62.80, and the tolerance_counter = 7
 96
        solution chromosome =
 97
          first level: [ [ 2. 8. 16. 24. 28. 2.5 4. 1.5 3.5 3.5 2. 4.5 3. ]
           second level: [1. 5. 6. 3. 7. 3. 7. 5. 9. 2. 12. 15. 19.]
 98
 99
          third level: [4. 4. 2. 2. 3. 3. 2. 3. 2. 4. 2. 2. 2.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
103
        obi[gen-1] = 62.80 temp best value gen = 62.80
        No, maintain solution and obj[gen] = 62.80, and the tolerance_counter = 8
104
105
        solution chromosome =
106
          first level: [ [ 2. 8. 16. 24. 28. 2.5 4. 1.5 3.5 3.5 2. 4.5 3. ]
107
           second level: [1. 5. 6. 3. 7. 3. 7. 5. 9. 2. 12. 15. 19.]
          third level: [4. 4. 2. 2. 3. 3. 2. 3. 2. 4. 2. 2. 2.]]
108
109
        The No. 8 iteration is finished!
110
111
112
     The iteration is terminated and then visulize the solution:
113
114
        solution chromosome =
          first level: [ [ 2. 8. 16. 24. 28. 2.5 4. 1.5 3.5 3.5 2. 4.5 3. ] second level: [ 1. 5. 6. 3. 7. 3. 7. 5. 9. 2. 12. 15. 19.]
115
116
          third level: [4. 4. 2. 2. 3. 3. 2. 3. 2. 4. 2. 2. 2.]]
117
118
        Objective function values and some other indicators:
                                                           Obj0 + Obj1 = 250.00
119
           Obi0 = 21.00
                                  Obj1 = 229.00
          Total movement of crane: 36.00
120
121
           Total waiting time in berth position: 94.00
122
          Total index of q during berthing: 471.00
123
        Specific arrangement for each vessel:
124
           V_id: 0
                               li: 4.0
                                                   xi: 2.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 4.0
                                                                                                                              gama_i0: 1.0
                                                                                                                                                          gama_i1: 2.0
                     duration_time_i: 1.0
                                                         demand i: 60.0
                                                                                        work load i: 60.0
                                                                                                                         work load gap i: 0
                                                                                                                                 gama_i0: 5.0
125
           V_id: 1
                                                                        bow of i: 4.0
                               li: 8.0
                                                    xi: 8.0
                                                                                                    tail of i: 12.0
                                                                                                                                                             gama_i1: 7.0
                                                                                        work load_i: 140.0
                     duration_time_i: 2.0
                                                         demand_i: 140.0
                                                                                                                         work load gap_i: 0
126
           V id: 2
                               1i: 8.0
                                                                           bow of i: 12.0
                                                                                                       tail of i: 20.0
                                                                                                                                   gama i0: 6.0
                                                                                                                                                                gama i1:9
                                                    xi: 16.0
                       duration\_time\_i{:}~3.0
     .0
                                                           demand i: 120.0
                                                                                          work load i: 120.0
                                                                                                                           work load gap_i: 0
127
           V id: 3
                               li: 8.0
                                                    xi: 24.0
                                                                           bow of i: 20.0
                                                                                                       tail of i: 28.0
                                                                                                                                   gama i0: 3.0
                                                                                                                                                                gama il: 7
                                                                                                                           work load gap_i: 0
      .0
                       duration_time_i: 4.0
                                                           demand_i: 160.0
                                                                                          work load_i: 160.0
128
           V_id: 4
                                                                           bow of i: 26.0
                                                                                                       tail of i: 30.0
                                                                                                                                   gama i0: 7.0
                               li: 4.0
                                                   xi: 28.0
                                                                                                                                                                gama i1:
                                                                                             work load i: 160.0
     10.0
                          duration_time_i: 3.0
                                                              demand_i: 160.0
                                                                                                                              work load gap_i: 0
129
           V_id: 5
                               li: 5.0
                                                    xi: 2.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 5.0
                                                                                                                              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
130
           V id: 6
                               1i: 8.0
                                                    xi: 4.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 8.0
                                                                                                                              gama i0: 7.0
                                                                                                                                                          gama i1: 9.0
                     duration_time_i: 2.0
                                                         demand_i: 80.0
                                                                                        work load_i: 80.0
                                                                                                                         work load gap_i: 0
131
           V_id: 7
                               li: 3.0
                                                    xi: 1.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 3.0
                                                                                                                              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
                                                                        bow of i: 0.0
                                                                                                                              gama_i0: 9.0
132
           V id: 8
                               li: 7.0
                                                    xi: 3.5
                                                                                                    tail of i: 7.0
                                                                                                                                                          gama_i1: 12.0
                     duration time i: 3.0
                                                         demand i: 120.0
                                                                                        work load i: 120.0
                                                                                                                         work load gap i: 0
133
           V id: 9
                               li: 7.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 7.0
                                                                                                                              gama i0: 2.0
                                                                                                                                                          gama i1: 3.0
                                                        demand_i: 60.0
                                                                                        work load_i: 60.0
                                                                                                                         work load gap_i: 0
                     duration_time_i: 1.0
           V_id: 10
134
                                  li: 4.0
                                                       xi: 2.0
                                                                           bow of i: 0.0
                                                                                                       tail of i: 4.0
                                                                                                                                gama_i0: 12.0
                                                                                                                                                             gama_i1: 15.
     0
                                                         demand_i: 120.0
                                                                                        work load_i: 120.0
                                                                                                                         work load gap_i: 0
                     duration_time_i: 3.0
135
           V id: 11
                                 1i: 9.0
                                                      xi: 4.5
                                                                           bow of i: 0.0
                                                                                                       tail of i: 9.0
                                                                                                                                gama i0: 15.0
                                                                                                                                                             gama i1: 19.
     0
                     duration_time_i: 4.0
                                                        demand_i: 140.0
                                                                                                                         work load gap i: 0
                                                                                        work load i: 140.0
                                                                           bow of i: 0.0
                                                                                                                                gama_i0: 19.0
136
           V id: 12
                                  li: 6.0
                                                      xi: 3.0
                                                                                                       tail of i: 6.0
                                                                                                                                                             gama i1: 22.
     0
                     duration_time_i: 3.0
                                                         demand_i: 100.0
                                                                                       work load_i: 100.0
                                                                                                                         work load gap_i: 0
137
138
     Algorithm finished and the total CPU time: 1220 s
139
     End
140
```