```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=34336
 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_11_1 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 = 33
       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
34
   Iteration begin:
35
   Beging the No. 0 iteration:
     obj[0] = 32.80 temp_best_value_gen = 32.80
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 32.80 temp_best_value_gen = 32.80
40
     No, maintain solution and obj[gen] = 32.80, and the tolerance_counter = 1
41
42
     solution chromosome =
43
        first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
44
        second level: [3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.]
       third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
obj[gen-1] = 32.80 temp_best_value_gen = 32.80
49
50
     No, maintain solution and obj[gen] = 32.80, and the tolerance_counter = 2
51
     solution chromosome =
        first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
52
53
        second level: [ 3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.]
54
       third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 32.80 temp best value gen = 32.80
59
     No, maintain solution and obj[gen] = 32.80, and the tolerance_counter = 3
60
     solution chromosome =
        first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
61
       second level: [3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.] third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]]
62
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 32.80 temp_best_value_gen = 32.80
68
     No, maintain solution and obj[gen] = 32.80, and the tolerance_counter = 4
69
     solution chromosome =
70
        first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
71
        second level: [3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.]
       third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 32.80 temp best value gen = 32.80
76
     No, maintain solution and obj[gen] = 32.80, and the tolerance_counter = 5
77
78
     solution chromosome =
        first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
```

```
80
          second level: [ 3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.]
 81
          third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 84
 85
       obj[gen-1] = 32.80 temp best value gen = 32.80
       No, maintain solution and obj[gen] = 32.80, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
 89
          second level: [3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.]
 90
          third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 32.80 temp\_best\_value\_gen = 32.80
 95
        No, maintain solution and obj[gen] = 32.80, and the tolerance_counter = 7
 96
       solution chromosome =
 97
          first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
 98
          second level: [3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.]
 99
          third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
103
       obi[gen-1] = 32.80 temp best value gen = 32.80
104
       No, maintain solution and obj[gen] = 32.80, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
106
          second level: [3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.] third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]]
107
108
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 32.80 temp_best_value_gen = 32.80
        No, maintain solution and obj[gen] = 32.80, and the tolerance_counter = 9
113
114
       solution chromosome =
          first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
115
116
          second level: [3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.]
          third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 32.80 temp_best_value_gen = 32.80
122
       No, maintain solution and obj[gen] = 32.80, and the tolerance_counter = 10
123
        solution chromosome =
124
          first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
125
          second level: [3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.]
126
          third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]
127
        The No. 10 iteration is finished!
128
129
130
131 The iteration is terminated and then visulize the solution:
132
       solution chromosome =
133
          first level: [ [ 4.5 10.5 15. 21.5 26.5 28.5 2. 3. 4. 4.5 2. ]
134
          second level: [ 3. 3. 1. 3. 0. 5. 1. 4. 6. 8. 10.]
135
          third level: [7. 2. 3. 7. 3. 2. 2. 3. 3. 2. 3.]
136
        Objective function values and some other indicators:
                                                          Obj0 + Obj1 = 112.00
137
          Obj0 = 12.00
                                 Obj1 = 100.00
138
          Total movement of crane: 46.00
139
          Total waiting time in berth position: 44.00
140
          Total index of q during berthing: 475.00
141
        Specific arrangement for each vessel:
                              li: 9.0
                                                                                                                            gama i0: 3.0
142
          V id: 0
                                                   xi: 4.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                                                        gama i1: 4.0
                    duration_time_i: 1.0
                                                        demand_i: 60.0
                                                                                      work load_i: 60.0
                                                                                                                       work load gap_i: 0
143
          V_id: 1
                                                                          bow of i: 9.0
                              li: 3.0
                                                   xi: 10.5
                                                                                                     tail of i: 12.0
                                                                                                                                  gama_i0: 3.0
                                                                                                                                                              gama_i1: 6
                       duration_time_i: 3.0
                                                           demand_i: 120.0
                                                                                         work load_i: 120.0
                                                                                                                          work load gap_i: 0
     .0
144
          V id: 2
                                                   xi: 15.0
                                                                          bow of i: 12.0
                                                                                                     tail of i: 18.0
                                                                                                                                 gama i0: 1.0
                              li: 6.0
                                                                                                                                                              gama i1:3
                       duration time i: 2.0
                                                          demand i: 100.0
                                                                                         work load i: 100.0
                                                                                                                          work load gap i: 0
                                                                                                                                  gama_i0: 3.0
145
          V id: 3
                              1i: 7.0
                                                   xi: 21.5
                                                                          bow of i: 18.0
                                                                                                      tail of i: 25.0
                                                                                                                                                              gama i1:4
                                                          demand_i: 80.0
                                                                                                                          work load gap_i: 0
     .0
                       duration_time_i: 1.0
                                                                                         work load_i: 80.0
146
          V_id: 4
                                                                                                     tail of i: 28.0
                                                                                                                                 gama i0: 0.0
                                                   xi: 26.5
                                                                          bow of i: 25.0
                                                                                                                                                              gama_i1: 2
                              li: 3.0
                                                                                                                          work load gap_i: 0
     .0
                       duration_time_i: 2.0
                                                          demand_i: 100.0
                                                                                         work load_i: 100.0
                                                                                                                                  gama_i0: 5.0
147
          V_id: 5
                              li: 3.0
                                                   xi: 28.5
                                                                          bow of i: 27.0
                                                                                                      tail of i: 30.0
                                                                                                                                                              gama_i1: 9
                                                                                         work load i: 140.0
                                                                                                                          work load gap i: 0
                       duration time i: 4.0
                                                          demand i: 140.0
148
          V_id: 6
                                                   xi: 2.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 4.0
                                                                                                                            gama_i0: 1.0
                              1i: 4 0
                                                                                                                                                        gama_i1: 3.0
                                                        demand i: 60.0
                     duration time i: 2.0
                                                                                       work load i: 60.0
                                                                                                                       work load gap i: 0
149
          V_id: 7
                              li: 6.0
                                                   xi: 3.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 6.0
                                                                                                                            gama_i0: 4.0
                                                                                                                                                        gama_i1: 6.0
                     duration_time_i: 2.0
                                                        demand i: 100.0
                                                                                      work load i: 100.0
                                                                                                                       work load gap_i: 0
150
          V_id: 8
                                                                                                   tail of i: 8.0
                              li: 8.0
                                                   xi: 4.0
                                                                       bow of i: 0.0
                                                                                                                             gama_i0: 6.0
                                                                                                                                                        gama_i1: 8.0
                     duration_time_i: 2.0
                                                        demand_i: 100.0
                                                                                       work load_i: 100.0
                                                                                                                       work load gap_i: 0
151
          V id: 9
                              li: 9.0
                                                   xi: 4.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                            gama i0: 8.0
                                                                                                                                                        gama i1: 10.0
                    duration\_time\_i{:}~2.0
                                                                                                                       work load gap_i: 0
                                                        demand i: 60.0
                                                                                      work load_i: 60.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 4.0
                                                                                                                               gama_i0: 10.0
          V_id: 10
                                                     xi: 2.0
152
                                 li: 4.0
                                                                                                                                                           gama_i1: 13.
     0
                    duration_time_i: 3.0
                                                        demand i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
```

unknown

153 154 155 156	Algorithm finished and the total CPU time: 1300 s End