```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=28786
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'])
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_10_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 = 30
       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] = 25.20 temp_best_value_gen = 25.20
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 25.20 temp_best_value_gen = 25.20
40
     No, maintain solution and obj[gen] = 25.20, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
44
       second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
45
       third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]]
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
obj[gen-1] = 25.20 temp_best_value_gen = 25.20
49
50
     No, maintain solution and obj[gen] = 25.20, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
53
       second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
54
       third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 25.20 temp best value gen = 25.20
59
     No, maintain solution and obj[gen] = 25.20, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
62
       second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
63
       third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]]
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 25.20 temp_best_value_gen = 25.20
68
     No, maintain solution and obj[gen] = 25.20, and the tolerance_counter = 4
69
     solution chromosome =
70
       first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
71
       second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
       third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]]
73
     The No. 4 iteration is finished!
74
75
  Beging the No. 5 iteration:
     obi[gen-1] = 25.20 temp best value gen = 25.20
76
     No, maintain solution and obj[gen] = 25.20, and the tolerance_counter = 5
77
78
     solution chromosome =
        first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
```

```
80
           second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
 81
          third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
        obj[gen-1] = 25.20 temp_best_value_gen = 25.20
No, maintain solution_and obj[gen] = 25.20, and the tolerance_counter = 6
 85
 86
 87
        solution chromosome =
 88
          first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
 89
          second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
 90
          third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
        obj[gen-1] = 25.20 temp_best_value_gen = 25.20
 94
 95
        No, maintain solution and obj[gen] = 25.20, and the tolerance_counter = 7
 96
        solution chromosome =
 97
          first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
 98
           second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
 99
          third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
        obj[gen-1] = 25.20 temp best value gen = 25.20
103
104
        No, maintain solution and obj[gen] = 25.20, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
106
          second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
107
108
          third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]]
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 25.20 temp_best_value_gen = 25.20
        No, maintain solution and obj[gen] = 25.20, and the tolerance_counter = 9
113
114
        solution chromosome =
           first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
115
116
           second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
          third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
        obj[gen-1] = 25.20 temp_best_value_gen = 25.20
121
122
        No, maintain solution and obj[gen] = 25.20, and the tolerance_counter = 10
123
        solution chromosome =
124
          first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
125
          second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
126
          third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]]
127
        The No. 10 iteration is finished!
128
129
130
131 The iteration is terminated and then visulize the solution:
132
        solution chromosome =
          first level: [ [ 3.5 10.5 16.5 22.5 27.5 25.5 3.5 2. 2. 3.5]
133
134
           second level: [0. 1. 4. 3. 2. 6. 1. 2. 5. 7.]
135
          third level: [7. 5. 3. 6. 2. 2. 4. 2. 4. 2.]]
136
        Objective function values and some other indicators:
           Obj0 = 9.00
                                                        Obj0 + Obj1 = 90.00
137
                                 Obj1 = 81.00
138
           Total movement of crane: 50.00
139
          Total waiting time in berth position: 31.00
140
           Total index of q during berthing: 579.00
141
        Specific arrangement for each vessel:
                              li: 7.0
                                                                                                                              gama i0: 0.0
142
           V id: 0
                                                   xi: 3.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 7.0
                                                                                                                                                          gama i1: 1.0
                    duration_time_i: 1.0
                                                        demand_i: 80.0
                                                                                       work load_i: 80.0
                                                                                                                         work load gap_i: 0
143
           V_id: 1
                               li: 7.0
                                                    xi: 10.5
                                                                           bow of i: 7.0
                                                                                                       tail of i: 14.0
                                                                                                                                   gama_i0: 1.0
                                                                                                                                                               gama_i1: 2
                       duration_time_i: 1.0
                                                           demand_i: 60.0
                                                                                          work load_i: 60.0
                                                                                                                            work load gap_i: 0
144
           V id: 2
                               1i: 5.0
                                                   xi: 16.5
                                                                           bow of i: 14.0
                                                                                                       tail of i: 19.0
                                                                                                                                   gama i0: 4.0
                                                                                                                                                               gama il: 7
                       duration time i: 3.0
                                                           demand_i: 160.0
                                                                                          work load_i: 160.0
                                                                                                                            work load gap_i: 0
                                                                                                                                   gama_i0: 3.0
145
                                                                           bow of i: 19.0
           V id: 3
                               1i: 7.0
                                                    xi: 22.5
                                                                                                       tail of i: 26.0
                                                                                                                                                               gama i1:4
                                                           demand_i: 100.0
                                                                                          work load_i: 100.0
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 1.0
146
           V_id: 4
                                                                                                                                   gama_i0: 2.0
                                                   xi: 27.5
                                                                           bow of i: 26.0
                                                                                                       tail of i: 29.0
                                                                                                                                                               gama_i1: 6
                               li: 3.0
                       duration_time_i: 4.0
                                                                                                                           work load gap_i: 0
      .0
                                                           demand_i: 140.0
                                                                                          work load_i: 140.0
                                                                                                                                   gama_i0: 6.0
147
           V_id: 5
                               li: 9.0
                                                    xi: 25.5
                                                                           bow of i: 21.0
                                                                                                       tail of i: 30.0
                                                                                                                                                               gama_i1:
                                                                                             work load i: 160.0
                                                                                                                              work load gap i: 0
     10.0
                          duration time i: 4.0
                                                              demand i: 160.0
148
           V_id: 6
                                                   xi: 3.5
                                                                        bow of i: 0.0
                                                                                                                              gama_i0: 1.0
                               li: 7.0
                                                                                                    tail of i: 7.0
                                                                                                                                                          gama_i1: 2.0
                                                         demand_i: 80.0
                     duration time i: 1.0
                                                                                        work load i: 80.0
                                                                                                                         work load gap i: 0
149
           V_id: 7
                               li: 4.0
                                                    xi: 2.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 4.0
                                                                                                                              gama_i0: 2.0
                                                                                                                                                          gama_i1: 5.0
                     duration_time_i: 3.0
                                                         demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                         work load gap_i: 0
150
                                                                                                    tail of i: 4.0
           V_id: 8
                               li: 4.0
                                                    xi: 2.0
                                                                        bow of i: 0.0
                                                                                                                              gama_i0: 5.0
                                                                                                                                                          gama_i1: 7.0
                     duration_time_i: 2.0
                                                         demand_i: 100.0
                                                                                        work load_i: 100.0
                                                                                                                         work load gap_i: 0
151
           V id: 9
                                                                        bow of i: 0.0
                               li: 7.0
                                                    xi: 3.5
                                                                                                    tail of i: 7.0
                                                                                                                              gama i0: 7.0
                                                                                                                                                          gama i1: 9.0
                                                         demand i: 80.0
                                                                                       work load i: 80.0
                     duration time i: 2.0
                                                                                                                         work load gap_i: 0
152
153 Algorithm finished and the total CPU time: 1183 s
```

154 End		
154 End 155		