```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=53101
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_9_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 = 27
       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] = 22.60 temp_best_value_gen = 22.60
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 22.60 temp_best_value_gen = 22.60
40
     No, maintain solution and obj[gen] = 22.60, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 3. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
44
       second level: [0, 4, 2, 6, 4, 5, 5, 1, 1,]
       third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
obj[gen-1] = 22.60 temp_best_value_gen = 22.60
49
50
     No, maintain solution and obj[gen] = 22.60, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ ] 3. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
       second level: [0. 4. 2. 6. 4. 5. 5. 1. 1.]
53
54
       third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 22.60 temp best value gen = 22.60
59
     No, maintain solution and obj[gen] = 22.60, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [ [ 3. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
62
       second level: [0. 4. 2. 6. 4. 5. 5. 1. 1.]
       third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
     obj[gen-1] = 22.60 temp_best_value_gen = 22.60
67
68
     No, maintain solution and obj[gen] = 22.60, and the tolerance_counter = 4
69
     solution chromosome =
       first level: [ [ 3. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
70
       second level: [0. 4. 2. 6. 4. 5. 5. 1. 1.]
71
       third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]]
73
     The No. 4 iteration is finished!
74
75
  Beging the No. 5 iteration:
     obi[gen-1] = 22.60 temp best value gen = 22.60
76
     No, maintain solution and obj[\overline{gen}] = \overline{22.60}, and the tolerance_counter = 5
77
78
     solution chromosome =
        first level: [ [ 3. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
```

```
80
           second level: [0. 4. 2. 6. 4. 5. 5. 1. 1.]
          third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]]
 81
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 22.60 temp_best_value_gen = 22.60
No, maintain solution_and_obj[gen] = 22.60, and the tolerance_counter = 6
 85
 86
 87
        solution chromosome =
 88
          first level: [ [ 3. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
 89
          second level: [0. 4. 2. 6. 4. 5. 5. 1. 1.]
 90
          third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 22.60 temp\_best\_value\_gen = 22.60
 95
        No, maintain solution and obj[gen] = 22.60, and the tolerance_counter = 7
 96
        solution chromosome =
 97
          first level: [ [ 3. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
 98
          second level: [0. 4. 2. 6. 4. 5. 5. 1. 1.]
 99
          third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]]
100
        The No. 7 iteration is finished!
101
102
     Beging the No. 8 iteration:
        obj[gen-1] = 22.60 temp best value gen = 22.60
103
104
        No, maintain solution and obj[gen] = 22.60, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [ 3. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
106
          second level: [0. 4. 2. 6. 4. 5. 5. 1. 1.]
107
          third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]
108
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 22.60 temp\_best\_value\_gen = 22.60
        No, maintain solution and obj[gen] = 22.60, and the tolerance_counter = 9
113
114
        solution chromosome =
115
          first level: [ [ 3. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
116
          second level: [0. 4. 2. 6. 4. 5. 5. 1. 1.]
          third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 22.60 temp_best_value_gen = 22.60
122
        No, maintain solution and obj[gen] = 22.60, and the tolerance_counter = 10
123
        solution chromosome =
124
          first level: [ [ 3. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
125
          second level: [0. 4. 2. 6. 4. 5. 5. 1. 1.]
126
          third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]
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. 7.5 10.5 14.5 21. 1.5 27. 3.5 26.5]
133
134
          second level: [0. 4. 2. 6. 4. 5. 5. 1. 1.]
135
          third level: [3. 3. 2. 2. 6. 2. 3. 3. 3.]
136
        Objective function values and some other indicators:
137
          Obj0 = 8.00
                                 Obj1 = 74.00
                                                        Obj0 + Obj1 = 82.00
138
           Total movement of crane: 46.00
139
          Total waiting time in berth position: 28.00
140
          Total index of q during berthing: 496.00
141
        Specific arrangement for each vessel:
                                                                                                                             gama i0: 0.0
142
           V_id: 0
                              li: 6.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 6.0
                                                                                                                                                         gama i1: 1.0
                    duration_time_i: 1.0
                                                        demand_i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                        work load gap_i: 0
143
           V_id: 1
                              li: 3.0
                                                    xi: 7.5
                                                                        bow of i: 6.0
                                                                                                    tail of i: 9.0
                                                                                                                             gama_i0: 4.0
                                                                                                                                                          gama_i1: 6.0
                                                        demand_i: 80.0
                                                                                       work load_i: 80.0
                     duration_time_i: 2.0
                                                                                                                        work load gap_i: 0
144
           V id: 2
                                                                          bow of i: 9.0
                                                                                                      tail of i: 12.0
                                                                                                                                   gama i0: 2.0
                              li: 3.0
                                                   xi: 10.5
                                                                                                                                                               gama_i1: 6
                       duration time i: 4.0
                                                           demand_i: 160.0
                                                                                          work load_i: 160.0
                                                                                                                           work load gap_i: 0
     .0
                                                                                                                                  gama_i0: 6.0
145
           V id: 3
                               li: 5.0
                                                   xi: 14.5
                                                                          bow of i: 12.0
                                                                                                      tail of i: 17.0
                                                                                                                                                               gama i1:9
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 3.0
                                                           demand_i: 120.0
                                                                                          work load_i: 120.0
          V_id: 4
146
                                                   xi: 21.0
                                                                          bow of i: 17.0
                                                                                                      tail of i: 25.0
                                                                                                                                  gama_i0: 4.0
                              li: 8.0
                                                                                                                                                               gama i1:5
                                                           demand_i: 100.0
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 1.0
                                                                                          work load i: 100.0
147
           V_id: 5
                                                   xi: 1.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 3.0
                                                                                                                             gama_i0: 5.0
                                                                                                                                                          gama_i1: 9.0
                               li: 3.0
                    duration_time_i: 4.0
                                                        demand i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap i: 0
148
           V id: 6
                                                                          bow of i: 24.0
                                                                                                      tail of i: 30.0
                                                                                                                                                               gama_i1: 7
                              li: 6.0
                                                   xi: 27.0
                                                                                                                                   gama_i0: 5.0
                                                                                         work load i: 100.0
                       duration time i: 2.0
                                                           demand i: 100.0
                                                                                                                           work load gap i: 0
149
           V_id: 7
                               li: 7.0
                                                                        bow of i: 0.0
                                                                                                   tail of i: 7.0
                                                                                                                             gama_i0: 1.0
                                                                                                                                                          gama_i1: 3.0
                                                                                       work load_i: 100.0
                    duration_time_i: 2.0
                                                        demand_i: 100.0
                                                                                                                        work load gap_i: 0
           V_id: 8
                                                                          bow of i: 25.0
                                                                                                      tail of i: 28.0
                                                                                                                                   gama_i0: 1.0
150
                              li: 3.0
                                                   xi: 26.5
                                                                                                                                                               gama_i1: 3
                       duration_time_i: 2.0
                                                           demand_i: 100.0
                                                                                          work load_i: 100.0
                                                                                                                           work load gap_i: 0
     .0
151
152 Algorithm finished and the total CPU time: 1047 s
153 End
154
```