```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=26638
 2
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
     01_My_Python_Code', 'E:/1 \\ \text{0} \\ \
     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_5_4 standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
     Start
16
17
     Before iteration:
18
         Read basic data
19
         Parameter setting:
20
            trail = 58
21
            Pop\_size = 30
             Tolerance iteration unchanged number = 10
23
             Chrom\_size = 15
            Iter_num_GA = 300
24
25
             Select_rate = 0.85
26
             Crossover rate = 0.95
             Mutation rate = 0.95
27
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] = 11.00 temp_best_value_gen = 11.00
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 11.00 temp_best_value_gen = 11.00
40
41
         No, maintain solution and obj[gen] = 11.00, and the tolerance_counter = 1
42
         solution chromosome =
43
             first level: [ [ 1.5 5.5 11. 16.5 21.5]
            second level: [2. 0. 0. 0. 3.]
44
45
            third level: [2. 4. 4. 3. 5.]]
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
         obj[gen-1] = 11.00 temp\_best\_value\_gen = 11.00
49
50
         No, maintain solution and obj[gen] = 11.00, and the tolerance_counter = 2
51
         solution chromosome =
52
             first level: [ [ 1.5 5.5 11. 16.5 21.5]
53
             second level: [2. 0. 0. 0. 3.]
54
            third level: [2. 4. 4. 3. 5.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 11.00 temp best value gen = 11.00
59
         No, maintain solution and obj[gen] = 11.00, and the tolerance_counter = 3
60
         solution chromosome =
             first level: [[1.5 5.5 11. 16.5 21.5]
61
62
             second level: [2. 0. 0. 0. 3.]
63
            third level: [2. 4. 4. 3. 5.]]
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 11.00 temp_best_value_gen = 11.00
68
         No, maintain solution and obj[gen] = 11.00, and the tolerance_counter = 4
69
         solution chromosome =
             first level: [ [ 1.5  5.5 11. 16.5 21.5]
70
71
             second level: [2. 0. 0. 0. 3.]
            third level: [2. 4. 4. 3. 5.]]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obi[gen-1] = 11.00 temp best value gen = 11.00
76
         No, maintain solution and obj[gen] = 11.00, and the tolerance_counter = 5
77
78
         solution chromosome =
             first level: [ [ 1.5 5.5 11. 16.5 21.5]
```

```
second level: [2. 0. 0. 0. 3.]
 80
 81
          third level: [2. 4. 4. 3. 5.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 11.00 temp best value gen = 10.00
 86
        Yes, update solution and obj[gen] = 10.00
 87
        solution chromosome =
 88
          first level: [ [ 1.5 5.5 11. 16.5 21.5]
 89
          second level: [2. 0. 0. 0. 3.]
 90
          third level: [2. 4. 4. 3. 2.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 10.00 temp\_best\_value\_gen = 10.00
 95
       No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 1
 96
       solution chromosome =
 97
          first level: [ [ 1.5  5.5 11. 16.5 21.5]
 98
          second level: [2. 0. 0. 0. 3.]
 99
          third level: [2. 4. 4. 3. 2.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 10.00 temp best value gen = 10.00
103
104
       No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 2
105
        solution chromosome =
          first level: [ [ 1.5  5.5 11. 16.5 21.5]
106
107
          second level: [2. 0. 0. 0. 3.]
108
          third level: [2. 4. 4. 3. 2.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 10.00 temp\_best\_value\_gen = 10.00
113
       No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 3
       solution chromosome =
114
          first level: [ [ 1.5 5.5 11. 16.5 21.5]
115
116
          second level: [2. 0. 0. 0. 3.]
          third level: [2, 4, 4, 3, 2,]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 10.00 temp\_best\_value\_gen = 10.00
122
       No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 4
123
        solution chromosome =
124
          first level: [ [ 1.5 5.5 11. 16.5 21.5]
          second level: [2. 0. 0. 0. 3.]
125
126
          third level: [2. 4. 4. 3. 2.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 10.00 temp\_best\_value\_gen = 10.00
130
131
       No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 5
132
       solution chromosome =
          first level: [ [ 1.5  5.5 11. 16.5 21.5]
133
134
          second level: [2. 0. 0. 0. 3.]
135
          third level: [2, 4, 4, 3, 2,]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 10.00 temp_best_value_gen = 10.00
140
       No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 6
141
        solution chromosome =
142
          first level: [ [ 1.5 5.5 11. 16.5 21.5]
          second level: [2. 0. 0. 0. 3.]
143
          third level: [2. 4. 4. 3. 2.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 10.00 temp\_best\_value\_gen = 10.00
149
       No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 7
150
       solution chromosome =
151
          first level: [ [ 1.5 5.5 11. 16.5 21.5]
152
          second level: [2. 0. 0. 0. 3.]
153
          third level: [2, 4, 4, 3, 2,]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 10.00 temp_best_value_gen = 10.00
158
       No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 8
159
        solution chromosome =
160
          first level: [ [ 1.5 5.5 11. 16.5 21.5]
          second level: [2. 0. 0. 0. 3.]
161
162
          third level: [2. 4. 4. 3. 2.]]
       The No. 14 iteration is finished!
163
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164
165 Beging the No. 15 iteration:
        obj[gen-1] = 10.00 temp_best_value_gen = 10.00
166
167
        No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 9
168
        solution chromosome =
          first level: [ [ 1.5 5.5 11. 16.5 21.5]
169
170
          second level: [2. 0. 0. 0. 3.]
171
          third level: [2. 4. 4. 3. 2.]]
172
        The No. 15 iteration is finished!
173
174
     Beging the No. 16 iteration:
175
        obj[gen-1] = 10.00 temp_best_value_gen = 10.00
176
        No, maintain solution and obj[gen] = 10.00, and the tolerance counter = 10
177
        solution chromosome =
          first level: [ [ 1.5  5.5 11. 16.5 21.5]
178
179
          second level: [2. 0. 0. 0. 3.]
180
          third level: [2. 4. 4. 3. 2.]]
181
        The No. 16 iteration is finished!
182
183
184
185 The iteration is terminated and then visulize the solution:
186
        solution chromosome =
          first level: [ [ 1.5  5.5 11. 16.5 21.5]
187
          second level: [2. 0. 0. 0. 3.]
188
          third level: [2. 4. 4. 3. 2.]]
189
190
        Objective function values and some other indicators:
                                Obj1 = 5.00
191
          Obio = 5.00
                                                       Obj0 + Obj1 = 10.00
192
          Total movement of crane: 0.00
193
          Total waiting time in berth position: 5.00
194
          Total index of q during berthing: 268.00
195
        Specific arrangement for each vessel:
196
           V_id: 0
                              li: 3.0
                                                  xi: 1.5
                                                                      bow of i: 0.0
                                                                                                  tail of i: 3.0
                                                                                                                           gama_i0: 2.0
                                                                                                                                                      gama_i1: 6.0
                    duration_time_i: 4.0
                                                       demand_i: 140.0
                                                                                     work load_i: 140.0
                                                                                                                      work load gap_i: 0
197
                                                                                                                           gama_i0: 0.0
          V_id: 1
                              li: 5.0
                                                  xi: 5.5
                                                                      bow of i: 3.0
                                                                                                  tail of i: 8.0
                                                                                                                                                      gama_i1: 1.0
                                                       demand_i: 80.0
                                                                                     work load_i: 80.0
                    duration_time_i: 1.0
                                                                                                                      work load gap_i: 0
           V id: 2
198
                              li: 6.0
                                                  xi: 11.0
                                                                         bow of i: 8.0
                                                                                                    tail of i: 14.0
                                                                                                                                gama_i0: 0.0
                                                                                                                                                            gama_i1: 2
                       duration time i: 2.0
                                                          demand i: 160.0
                                                                                        work load i: 160.0
                                                                                                                        work load gap_i: 0
     .0
199
                                                                                                                                gama_i0: 0.0
           V_id: 3
                                                                         bow of i: 14.0
                                                                                                    tail of i: 19.0
                              li: 5.0
                                                  xi: 16.5
                                                                                                                                                            gama_i1: 2
     .0
                       duration\_time\_i{:}~2.0
                                                          demand_i: 100.0
                                                                                        work load_i: 100.0
                                                                                                                        work load gap_i: 0
200
           V_id: 4
                              1i: 5.0
                                                  xi: 21.5
                                                                         bow of i: 19.0
                                                                                                    tail of i: 24.0
                                                                                                                                gama_i0: 3.0
                                                                                                                                                           gama_i1: 6
                       duration_time_i: 3.0
                                                          demand i: 100.0
                                                                                        work load i: 100.0
                                                                                                                        work load gap_i: 0
     .0
201
202 Algorithm finished and the total CPU time: 966 \ s
203 End
204
```