```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=4974
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   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_2_1 _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 = 43
21
       Pop\_size = 10
       Tolerance iteration unchanged number = 6
23
       Chrom\_size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.8
26
       Crossover rate = 0.95
27
       Mutation rate = 0.8
28
       Mu_oper_type = 2
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] = 8.10 temp_best_value_gen = 8.10
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 8.10 temp_best_value_gen = 8.10
41
     No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [2. 8.]
       second level: [2, 3,]
44
       third level: [3. 6.]]
45
     The No. 1 iteration is finished!
46
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 8.10 temp_best_value_gen = 8.10
49
50
     No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 2
51
     solution chromosome =
       first level: [ [2. 8.]
52
53
       second level: [2.3.]
54
       third level: [3. 6.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obj[gen-1] = 8.10 temp best value gen = 6.07
59
     Yes, update solution and obj[gen] = 6.07
60
     solution chromosome =
61
       first level: [[2. 4.45]
62
       second level: [0. 2.]
63
       third level: [4. 7.]]
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 6.07 temp_best_value_gen = 6.07
68
     No, maintain solution and obj[gen] = 6.07, and the tolerance_counter = 1
69
     solution chromosome =
       first level: [ [2. 4.45] second level: [0. 2.]
70
71
       third level: [4. 7.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 6.07 temp best value gen = 4.69
76
     Yes, update solution and obj[gen] = 4.69
77
     solution chromosome =
78
       first level: [ [2. 4.15]
```

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second level: [0, 2,]
 81
          third level: [4. 6.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 4.69 temp best value gen = 4.69
       No, maintain solution and obj[gen] = \overline{4}.69 , and the tolerance_counter = 1
 86
 87
        solution chromosome =
 88
          first level: [ [2. 4.15]
          second level: [0, 2.]
 89
 90
          third level: [4. 6.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
       obj[gen-1] = 4.69 temp_best_value_gen = 4.69
 95
       No, maintain solution and obj[gen] = 4.69, and the tolerance_counter = 2
 96
       solution chromosome =
 97
          first level: [ [2. 4.15]
          second level: [0. 2.]
 98
 99
          third level: [4. 6.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103
       obj[gen-1] = 4.69 temp best value gen = 4.69
104
       No, maintain solution and obj[gen] = 4.69, and the tolerance_counter = 3
105
        solution chromosome =
          first level: [ [2. 4.15]
106
107
          second level: [0. 2.]
108
          third level: [4. 6.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 4.69 temp_best_value_gen = 4.64
        Yes, update solution and obj[gen] = 4.64
113
       solution chromosome =
114
115
          first level: [ [2. 4.14]
          second level: [0. 2.]
116
117
          third level: [4. 8.]]
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 4.64 temp_best_value_gen = 4.60
122
        Yes, update solution and obj[gen] = 4.60
123
        solution chromosome =
124
          first level: [[2. 4.13]
125
          second level: [0. 2.]
126
          third level: [4. 7.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 4.60 temp_best_value_gen = 4.60
131
       No, maintain solution and obj[gen] = 4.60, and the tolerance_counter = 1
132
       solution chromosome =
133
          first level: [ [2. 4.13]
134
          second level: [0. 2.]
135
          third level: [4. 7.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 4.60 temp_best_value_gen = 4.60
140
       No, maintain solution and obj[gen] = 4.60, and the tolerance_counter = 2
141
        solution chromosome =
142
          first level: [ [2. 4.13]
143
          second level: [0. 2.]
          third level: [4. 7.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 4.60 temp_best_value_gen = 4.60
149
       No, maintain solution and obj[gen] = 4.60, and the tolerance_counter = 3
150
       solution chromosome =
151
          first level: [ [2. 4.13]
152
          second level: [0. 2.]
153
          third level: [4. 7.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 4.60 temp_best_value_gen = 4.60
158
       No, maintain solution and obj[gen] = 4.60, and the tolerance_counter = 4
159
        solution chromosome =
160
          first level: [ [2. 4.13]
          second level: [0. 2.]
161
162
          third level: [4. 7.]]
163
       The No. 14 iteration is finished!
```

```
unknown
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 4.60 temp_best_value_gen = 4.60
166
167
        No, maintain solution and obj[gen] = 4.60, and the tolerance_counter = 5
168
        solution chromosome =
169
          first level: [[2. 4.13]
          second level: [0. 2.]
170
171
          third level: [4. 7.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
        obj[gen-1] = 4.60 temp_best_value_gen = 4.60
176
        No, maintain solution and obj[gen] = 4.60, and the tolerance counter = 6
177
        solution chromosome =
178
          first level: [ [2. 4.13]
          second level: [0. 2.]
179
          third level: [4. 7.]]
180
181
        The No. 16 iteration is finished!
182
183
184 ----
185 The iteration is terminated and then visulize the solution:
186
        solution chromosome =
187
          first level: [ [2. 4.13]
188
          second level: [0. 2.]
          third level: [4. 7.]]
189
190
        Objective function values and some other indicators:
191
                                Obj1 = 8.00
                                                      Obj0 + Obj1 = 10.00
          Obj0 = 2.00
192
          Total movement of crane: 6.00
193
          Total waiting time in berth position: 2.00
194
          Total index of q during berthing: 27.00
        Specific arrangement for each vessel:
195
                                                                     bow of i: 0.0
196
           V_id: 0
                              li: 4.0
                                                  xi: 2.0
                                                                                                tail of i: 4.0
                                                                                                                        gama_i0: 0.0
                                                                                                                                                   gama_i1: 2.0
                    duration_time_i: 2.0
                                                      demand_i: 160.0
                                                                                    work load_i: 160.0
                                                                                                                   work load gap_i: 0
197
                                                                     bow of i: 0.1
                                                                                                                        gama_i0: 2.0
          V_id: 1
                              li: 8.0
                                                  xi: 4.1
                                                                                                tail of i: 8.1
                                                                                                                                                   gama_i1: 3.0
                                                                                    work load_i: 120.0
                    duration_time_i: 1.0
                                                      demand_i: 120.0
                                                                                                                   work load gap_i: 0
198
199 Algorithm finished and the total CPU time: 142 s
200 End
201
```