```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=36796
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')
  Backend TkAgg is interactive backend. Turning interactive mode on.
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:
       trail = 15
20
21
       Pop\_size = 10
       Tolerance iteration unchanged number = 8
23
       Chrom size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.8
26
       Crossover rate = 0.75
       Mutation rate = 0.95
27
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 1
30
       coefficient for Obj1= 0.5
       coefficient for Obj2= 1.5
31
       gen = 0
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 7.00 temp_best_value_gen = 7.00
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 7.00 temp_best_value_gen = 7.00
41
     No, maintain solution and obj[gen] = 7.00, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [2. 8.]
       second level: [2. 1.]
44
       third level: [2. 4.]]
45
     The No. 1 iteration is finished!
46
47
   Beging the No. 2 iteration:
obj[gen-1] = 7.00 temp_best_value_gen = 7.00
48
49
50
     No, maintain solution and obj[gen] = 7.00, and the tolerance_counter = 2
51
     solution chromosome =
       first level: [ [2. 8.]
52
       second level: [2. 1.]
53
54
       third level: [2. 4.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 7.00 temp best value gen = 7.00
59
     No, maintain solution and obj[gen] = 7.00, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [ [2. 8.]
       second level: [2. 1.]
62
63
       third level: [2. 4.]]
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 7.00 temp_best_value_gen = 7.00
68
     No, maintain solution and obj[gen] = 7.00, and the tolerance_counter = 4
69
     solution chromosome =
70
       first level: [ [2. 8.]
71
       second level: [2. 1.]
       third level: [2. 4.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 7.00 temp best value gen = 7.00
76
     No, maintain solution and obj[gen] = 7.00, and the tolerance counter = 5
77
78
     solution chromosome =
       first level: [ [2. 8.]
```

```
second level: [2, 1,]
 81
          third level: [2, 4,]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 7.00 temp_best_value_gen = 7.00
No, maintain solution_and_obj[gen] = 7.00, and the tolerance_counter = 6
 85
 86
 87
        solution chromosome =
 88
          first level: [ [2. 8.]
 89
          second level: [2. 1.]
 90
          third level: [2. 4.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 7.00 temp_best_value_gen = 4.00
 94
 95
        Yes, update solution and obj[gen] = 4.00
 96
        solution chromosome =
 97
          first level: [ [2. 8.]
 98
          second level: [1. 1.]
 99
          third level: [4, 4,]]
100
        The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103
        obj[gen-1] = 4.00 temp best value gen = 4.00
104
        No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 1
105
        solution chromosome =
          first level: [ [2. 8.]
106
107
          second level: [1.1.]
108
          third level: [4. 4.]]
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
113
        No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 2
        solution chromosome =
114
115
          first level: [ [2. 8.]
116
          second level: [1. 1.]
          third level: [4, 4,]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
122
        No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 3
123
        solution chromosome =
124
          first level: [ [2. 8.]
125
          second level: [1. 1.]
126
          third level: [4. 4.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
131
        No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 4
132
        solution chromosome =
133
          first level: [ [2. 8.]
134
          second level: [1.1.]
135
          third level: [4, 4,]]
136
        The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
140
        No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 5
141
        solution chromosome =
142
          first level: [ [2. 8.]
          second level: [1. 1.]
143
          third level: [4. 4.]]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
149
        No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 6
150
        solution chromosome =
151
          first level: [ [2. 8.]
152
          second level: [1. 1.]
153
          third level: [4. 4.]]
154
        The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
158
        No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 7
159
        solution chromosome =
160
          first level: [ [2. 8.]
          second level: [1, 1,]
161
162
          third level: [4. 4.]]
163
        The No. 14 iteration is finished!
```

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unknown
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
166
167
        No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 8
168
        solution chromosome =
169
           first level: [ [2. 8.]
           second level: [1. 1.]
170
171
           third level: [4. 4.]]
172
        The No. 15 iteration is finished!
173
174
175
176 The iteration is terminated and then visulize the solution:
177
        solution chromosome =
178
           first level: [ [2. 8.]
179
           second level: [1. 1.]
180
           third level: [4, 4,]
181
        Objective function values and some other indicators:
          Obj0 = 2.00
                                                      Obj0 + Obj1 = 4.00
182
                                Obj1 = 2.00
183
           Total movement of crane: 0.00
184
           Total waiting time in berth position: 2.00
185
           Total index of q during berthing: 43.00
186
        Specific arrangement for each vessel:
                                                                                                tail of i: 4.0
187
                             li: 4.0
           V_id: 0
                                                  xi: 2.0
                                                                     bow of i: 0.0
                                                                                                                         gama i0: 1.0
                                                                                                                                                    gama_i1: 3.0
                    duration\_time\_i{:}~2.0
                                                      demand_i: 160.0
                                                                                    work load_i: 160.0
                                                                                                                    work load gap_i: 0
           V_id: 1
188
                                                  xi: 8.0
                                                                     bow of i: 4.0
                             li: 8.0
                                                                                                tail of i: 12.0
                                                                                                                           gama_i0: 1.0
                                                                                                                                                      gama_i1: 3.0
                    duration_time_i: 2.0
                                                      demand i: 120.0
                                                                                    work load_i: 120.0
                                                                                                                    work load gap_i: 0
189
190\,\, Algorithm finished and the total CPU time: 128\;s
191 End
192
```