```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=13925
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   01_My_Python_Code'])
6
  PyDev console: starting.
8
  Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
  python code/01_My_Python_Code')
10 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 = 54
20
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 = 0.9
       Mutation rate = 0.95
27
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 1
30
       coefficient for Obj1= 1.5
       coefficient for Obj2= 0.5
31
       gen = 0
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
36
     obj[0] = 14.00
                  temp_best_value_gen = 14.00
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 14.00 temp_best_value_gen = 14.00
41
     No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [2. 8.]
       second level: [2. 5.]
44
       third level: [2. 2.]]
45
     The No. 1 iteration is finished!
46
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 14.00 temp_best_value_gen = 14.00
49
50
     No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [2. 8.]
       second level: [2. 5.]
53
54
       third level: [2. 2.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 14.00 temp best value gen = 9.50
     Yes, update solution and obj[gen] = 9.50
59
60
     solution chromosome =
61
       first level: [ [2. 8.]
       second level: [2. 2.]
62
63
       third level: [2. 2.]]
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 9.50 temp_best_value_gen = 9.50
68
     No, maintain solution and obj[gen] = 9.50, and the tolerance_counter = 1
69
     solution chromosome =
70
       first level: [ [2. 8.]
       second level: [2. 2.]
71
       third level: [2. 2.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 9.50 temp best value gen = 9.50
76
     No, maintain solution and obj[gen] = 9.50, and the tolerance counter = 2
77
     solution chromosome =
78
       first level: [ [2. 8.]
```

```
80
          second level: [2. 2.]
 81
          third level: [2. 2.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 9.50 temp best value gen = 9.00
 85
        Yes, update solution and obj[gen] = 9.00
 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] = 9.00 temp_best_value_gen = 9.00
 94
 95
       No, maintain solution and obj[gen] = 9.00, and the tolerance_counter = 1
 96
       solution chromosome =
 97
          first level: [ [2. 8.]
 98
          second level: [2. 1.]
          third level: [2. 4.]]
 99
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103
       obj[gen-1] = 9.00 temp best value gen = 9.00
104
       No, maintain solution and obj[gen] = 9.00, and the tolerance_counter = 2
105
        solution chromosome =
          first level: [ [2. 8.]
106
107
          second level: [2. 1.]
108
          third level: [2. 4.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 9.00 temp_best_value_gen = 9.00
113
       No, maintain solution and obj[gen] = 9.00, and the tolerance_counter = 3
       solution chromosome =
114
115
          first level: [ [2. 8.]
116
          second level: [2. 1.]
          third level: [2, 4,]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 9.00 temp_best_value_gen = 9.00
       No, maintain solution and obj[gen] = 9.00, and the tolerance_counter = 4
122
123
        solution chromosome =
124
          first level: [ [2. 8.]
125
          second level: [2. 1.]
126
          third level: [2. 4.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 9.00 temp_best_value_gen = 9.00
131
       No, maintain solution and obj[gen] = 9.00, and the tolerance_counter = 5
132
       solution chromosome =
133
          first level: [ [2. 8.]
134
          second level: [2. 1.]
135
          third level: [2. 4.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
       obj[gen-1] = 9.00 temp_best_value gen = 4.00
139
140
        Yes, update solution and obj[gen] = 4.00
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 = 1
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 = 2
159
        solution chromosome =
160
          first level: [ [2. 8.]
          second level: [1, 1,]
161
162
          third level: [4. 4.]]
       The No. 14 iteration is finished!
163
```

```
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 = 3
168
        solution chromosome =
169
           first level: [ [2. 8.]
170
           second level: [1. 1.]
171
           third level: [4. 4.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
176
        No, maintain solution and obj[gen] = 4.00, and the tolerance counter = 4
177
        solution chromosome =
178
           first level: [ [2. 8.]
179
           second level: [1. 1.]
           third level: [4. 4.]]
180
181
        The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
184
185
        No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 5
186
        solution chromosome =
187
           first level: [ [2. 8.]
           second level: [1, 1,]
188
           third level: [4. 4.]]
189
190
        The No. 17 iteration is finished!
191
192
      Beging the No. 18 iteration:
193
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
194
        No, maintain solution and obj[gen] = 4.00, and the tolerance counter = 6
195
        solution chromosome =
196
           first level: [ [2. 8.]
197
           second level: [1. 1.]
198
           third level: [4. 4.]]
199
        The No. 18 iteration is finished!
200
201
202
203 The iteration is terminated and then visulize the solution:
204
        solution chromosome =
205
           first level: [ [2. 8.]
           second level: [1. 1.]
206
207
           third level: [4. 4.]]
208
        Objective function values and some other indicators:
209
           Obj0 = 2.00
                                Obj1 = 2.00
                                                       Obj0 + Obj1 = 4.00
           Total movement of crane: 0.00
210
211
           Total waiting time in berth position: 2.00
212
           Total index of q during berthing: 43.00
213
        Specific arrangement for each vessel:
214
           V_id: 0
                              li: 4.0
                                                  xi: 2.0
                                                                      bow of i: 0.0
                                                                                                 tail of i: 4.0
                                                                                                                         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
215
           V_id: 1
                                                  xi: 8.0
                                                                     bow of i: 4.0
                                                                                                tail of i: 12.0
                                                                                                                           gama i0: 1.0
                              li: 8.0
                                                                                                                                                       gama_i1: 3.0
                     duration_time_i: 2.0
                                                       demand_i: 120.0
                                                                                    work load_i: 120.0
                                                                                                                    work load gap_i: 0
216
217 Algorithm finished and the total CPU time: 160 s
218 End
219
```