```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=2572
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.
   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:
       trail = 19
20
21
       Pop\_size = 10
       Tolerance iteration unchanged number = 6
23
       Chrom\_size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.9
26
       Crossover rate = 0.9
27
       Mutation rate = 0.75
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 2
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] = 16.00
                  temp_best_value_gen = 16.00
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 16.00 temp_best_value_gen = 16.00
41
     No, maintain solution and obj[gen] = 16.00, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [2. 8.]
       second level: [5. 3.]
44
       third level: [2. 5.]]
45
     The No. 1 iteration is finished!
46
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 16.00 temp_best_value_gen = 16.00
49
50
     No, maintain solution and obj[gen] = 16.00, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [2. 8.]
       second level: [5. 3.]
53
54
       third level: [2. 5.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 16.00 temp best value gen = 11.00
     Yes, update solution and obj[gen] = 11.00
59
60
     solution chromosome =
61
       first level: [ [2. 8.]
62
       second level: [3. 1.]
       third level: [2. 4.]]
63
     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 = 1
69
     solution chromosome =
70
       first level: [ [2. 8.]
71
       second level: [3. 1.]
       third level: [2. 4.]]
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 = 2
77
     solution chromosome =
78
       first level: [ [2. 8.]
```

```
second level: [3, 1,]
 81
          third level: [2, 4,]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 11.00 temp_best_value_gen = 11.00
No, maintain solution_and_obj[gen] = 11.00, and the tolerance_counter = 3
 85
 86
 87
        solution chromosome =
 88
          first level: [ [2. 8.]
 89
          second level: [3. 1.]
 90
          third level: [2. 4.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 11.00 temp_best_value_gen = 9.50
 94
 95
        Yes, update solution and obj[gen] = 9.50
 96
        solution chromosome =
 97
          first level: [ [8. 4.]
 98
          second level: [1.3.]
 99
          third level: [4. 2.]]
100
        The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
        obj[gen-1] = 9.50 temp best value gen = 3.50
103
104
        Yes, update solution and obj[gen] = 3.50
105
        solution chromosome =
          first level: [ [2. 8.]
106
107
          second level: [1. 0.]
108
          third level: [4. 8.]]
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
113
        No, maintain solution and obj[gen] = 3.50, and the tolerance_counter = 1
        solution chromosome =
114
115
          first level: [ [2. 8.]
116
          second level: [1. 0.]
          third level: [4, 8,]]
117
        The No. 9 iteration is finished!
118
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
        No, maintain solution and obj[gen] = 3.50, and the tolerance_counter = 2
122
123
        solution chromosome =
124
          first level: [ [2. 8.]
125
          second level: [1. 0.]
126
          third level: [4. 8.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
131
        No, maintain solution and obj[gen] = 3.50, and the tolerance_counter = 3
132
        solution chromosome =
133
          first level: [ [2. 8.]
134
          second level: [1. 0.]
135
          third level: [4. 8.]]
136
        The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
140
        No, maintain solution and obj[gen] = 3.50, and the tolerance_counter = 4
141
        solution chromosome =
142
          first level: [ [2. 8.]
143
          second level: [1. 0.]
          third level: [4. 8.]]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 3.50 temp_best_value_gen = 3.50
148
149
        No, maintain solution and obj[gen] = 3.50, and the tolerance_counter = 5
150
        solution chromosome =
151
          first level: [ [2. 8.]
152
          second level: [1. 0.]
153
          third level: [4. 8.]]
154
        The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
        obj[gen-1] = 3.50 temp_best_value_gen = 1.50
158
        Yes, update solution and obj[gen] = 1.50
159
        solution chromosome =
160
          first level: [ [2. 8.]
          second level: [0, 0,]
161
162
          third level: [4. 8.]]
163
        The No. 14 iteration is finished!
```

```
164
165 Beging the No. 15 iteration:
       obj[gen-1] = 1.50 temp_best_value_gen = 1.50
166
167
       No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 1
168
        solution chromosome =
169
          first level: [ [2, 8.]
170
          second level: [0. 0.]
171
          third level: [4. 8.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
       obj[gen-1] = 1.50 temp_best_value_gen = 1.50
       No, maintain solution and obj[gen] = 1.50, and the tolerance counter = 2
176
177
       solution chromosome =
178
          first level: [ [2. 8.]
179
          second level: [0. 0.]
180
          third level: [4. 8.]]
181
        The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
       obj[gen-1] = 1.50 temp_best_value_gen = 1.50
184
185
       No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 3
186
        solution chromosome =
187
          first level: [ [2. 8.]
          second level: [0. 0.]
188
          third level: [4. 8.]]
189
190
        The No. 17 iteration is finished!
191
192
     Beging the No. 18 iteration:
193
       obj[gen-1] = 1.50 temp_best_value_gen = 1.50
       No, maintain solution and obj[gen] = \overline{1.50}, and the tolerance_counter = 4
194
195
       solution chromosome =
196
          first level: [ [2. 8.]
197
          second level: [0. 0.]
198
          third level: [4. 8.]]
199
       The No. 18 iteration is finished!
200
201 Beging the No. 19 iteration:
202
       obj[gen-1] = 1.50 temp_best_value_gen = 1.50
203
        No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 5
204
        solution chromosome =
205
          first level: [ [2. 8.]
206
          second level: [0. 0.]
207
          third level: [4. 8.]]
208
        The No. 19 iteration is finished!
209
210 Beging the No. 20 iteration:
211
       obj[gen-1] = 1.50 temp_best_value_gen = 1.50
212
       No, maintain solution and obj[gen] = 1.50, and the tolerance_counter = 6
       solution chromosome =
213
          first level: [ [2. 8.]
214
215
          second level: [0. 0.]
216
          third level: [4. 8.]]
       The No. 20 iteration is finished!
217
218
219
220
221 The iteration is terminated and then visulize the solution:
222
       solution chromosome
223
          first level: [ [2. 8.]
224
          second level: [0. 0.]
225
          third level: [4. 8.]]
226
        Objective function values and some other indicators:
227
          Obio = 1.00
                               Obj1 = 0.00
                                                      Obj0 + Obj1 = 1.00
228
          Total movement of crane: 0.00
229
          Total waiting time in berth position: 0.00
230
          Total index of q during berthing: 51.00
231
        Specific arrangement for each vessel:
232
          V_id: 0
                             li: 4.0
                                                  xi: 2.0
                                                                     bow of i: 0.0
                                                                                                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
233
          V_id: 1
                                                                     bow of i: 4.0
                                                                                                tail of i: 12.0
                                                                                                                           gama_i0: 0.0
                             li: 8.0
                                                 xi: 8.0
                                                                                                                                                      gama_i1: 1.0
                                                                                    work load_i: 120.0
                    duration_time_i: 1.0
                                                      demand_i: 120.0
                                                                                                                    work load gap_i: 0
235 Algorithm finished and the total CPU time: 192 s
236 End
237
```