```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=12271
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_10_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 = 6
       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] = 10.33 temp_best_value_gen = 10.33
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 10.33 temp_best_value_gen = 10.33
40
41
     No, maintain solution and obj[gen] = 10.33, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [2.11 3.5 ]
       second level: [0, 3,]
44
       third level: [2. 3.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 10.33 temp_best_value_gen = 10.33
49
50
     No, maintain solution and obj[gen] = 10.33, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [2.11 3.5 ]
53
       second level: [0.3.]
54
       third level: [2. 3.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 10.33 temp best value gen = 10.33
59
     No, maintain solution and obj[gen] = 10.33, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [ [2.11 3.5 ]
62
       second level: [0. 3.]
       third level: [2. 3.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 10.33 temp_best_value_gen = 10.33
68
     No, maintain solution and obj[gen] = 10.33, and the tolerance_counter = 4
69
     solution chromosome =
70
       first level: [ [2.11 3.5 ]
71
       second level: [0.3.]
       third level: [2. 3.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 10.33 temp best value gen = 9.80
76
     Yes, update solution and obj[gen] = 9.80
77
     solution chromosome =
78
       first level: [ [2. 5.5]
```

```
second level: [0. 3.]
 81
          third level: [2. 3.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 9.80 temp best value gen = 9.80
       No, maintain solution and obj[gen] = 9.80, and the tolerance_counter = 1
 86
 87
        solution chromosome =
 88
          first level: [ [2. 5.5]
          second level: [0.3.]
 89
 90
          third level: [2. 3.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 9.80 temp_best_value_gen = 9.80
 94
 95
       No, maintain solution and obj[gen] = 9.80, and the tolerance_counter = 2
 96
       solution chromosome =
 97
          first level: [ [2. 5.5]
 98
          second level: [0.3.]
 99
          third level: [2. 3.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 9.80 temp best value gen = 9.80
103
104
       No, maintain solution and obj[gen] = 9.80, and the tolerance_counter = 3
105
        solution chromosome =
          first level: [ [2. 5.5]
106
107
          second level: [0.3.]
108
          third level: [2. 3.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 9.80 temp_best_value_gen = 8.10
113
        Yes, update solution and obj[gen] = 8.10
       solution chromosome =
114
115
          first level: [[5.5 2.]
116
          second level: [1. 0.]
          third level: [2, 2,]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 8.10 temp_best_value_gen = 8.10
122
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 1
123
        solution chromosome =
124
          first level: [[5.5 2.]
125
          second level: [1. 0.]
126
          third level: [2. 2.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 8.10 temp_best_value_gen = 5.70
130
131
        Yes, update solution and obj[gen] = 5.70
132
       solution chromosome =
          first level: [ [2. 5.5]
133
134
          second level: [0. 0.]
135
          third level: [2. 2.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 5.70 temp_best_value_gen = 5.70
140
       No, maintain solution and obj[gen] = 5.70, and the tolerance_counter = 1
141
        solution chromosome =
142
          first level: [ [2. 5.5]
143
          second level: [0. 0.]
          third level: [2. 2.]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 5.70 temp_best_value_gen = 5.70
148
149
       No, maintain solution and obj[gen] = 5.70, and the tolerance_counter = 2
150
       solution chromosome =
151
          first level: [ [2. 5.5]
152
          second level: [0. 0.]
153
          third level: [2. 2.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 5.70 temp_best_value_gen = 5.70
158
       No, maintain solution and obj[gen] = 5.70, and the tolerance_counter = 3
159
        solution chromosome =
160
          first level: [[2. 5.5]
          second level: [0. 0.]
161
162
          third level: [2. 2.]]
163
       The No. 14 iteration is finished!
```

```
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 5.70 temp_best_value_gen = 5.70
166
167
       No, maintain solution and obj[gen] = 5.70, and the tolerance_counter = 4
        solution chromosome =
168
169
          first level: [ [2. 5.5]
170
          second level: [0. 0.]
171
          third level: [2. 2.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
       obj[gen-1] = 5.70 temp_best_value_gen = 5.70
       No, maintain solution and obj[gen] = 5.70, and the tolerance counter = 5
176
177
       solution chromosome =
178
          first level: [ [2. 5.5]
179
          second level: [0. 0.]
180
          third level: [2. 2.]]
181
        The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
       obj[gen-1] = 5.70 temp_best_value_gen = 5.70
184
185
        No, maintain solution and obj[gen] = 5.70, and the tolerance_counter = 6
186
        solution chromosome =
187
          first level: [ [2. 5.5]
          second level: [0. 0.]
188
          third level: [2. 2.]]
189
190
        The No. 17 iteration is finished!
191
192
     Beging the No. 18 iteration:
193
       obj[gen-1] = 5.70 temp_best_value_gen = 5.70
194
       No, maintain solution and obj[gen] = 5.70, and the tolerance counter = 7
195
       solution chromosome =
196
          first level: [ [2. 5.5]
197
          second level: [0. 0.]
198
          third level: [2. 2.]]
199
       The No. 18 iteration is finished!
200
201 Beging the No. 19 iteration:
       obj[gen-1] = 5.70 temp_best_value_gen = 5.70
202
203
        No, maintain solution and obj[gen] = 5.70, and the tolerance_counter = 8
204
        solution chromosome =
205
          first level: [ [2. 5.5]
          second level: [0. 0.]
206
207
          third level: [2. 2.]]
208
        The No. 19 iteration is finished!
209
210 Beging the No. 20 iteration:
211
        obj[gen-1] = 5.70 temp_best_value_gen = 5.70
212
       No, maintain solution and obj[gen] = 5.70, and the tolerance_counter = 9
213
       solution chromosome =
214
          first level: [ [2. 5.5]
215
          second level: [0. 0.]
216
          third level: [2. 2.]]
217
       The No. 20 iteration is finished!
218
219 Beging the No. 21 iteration:
       obj[gen-1] = 5.70 temp best value gen = 5.70
220
221
       No, maintain solution and obj[gen] = 5.70, and the tolerance_counter = 10
222
        solution chromosome
223
          first level: [ [2. 5.5]
224
          second level: [0. 0.]
225
          third level: [2. 2.]]
226
       The No. 21 iteration is finished!
227
228
229
230 The iteration is terminated and then visulize the solution:
231
       solution chromosome =
232
          first level: [ [2. 5.5]
233
          second level: [0. 0.]
234
          third level: [2. 2.]
235
        Objective function values and some other indicators:
                                Obj1 = 0.00
236
          Obj0 = 3.00
                                                      Obj0 + Obj1 = 3.00
237
          Total movement of crane: 0.00
238
          Total waiting time in berth position: 0.00
239
          Total index of q during berthing: 33.00
240
        Specific arrangement for each vessel:
241
          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: 3.0
                                                      demand_i: 100.0
                    duration_time_i: 3.0
                                                                                    work load_i: 100.0
                                                                                                                    work load gap_i: 0
                                                                     bow of i: 4.0
242
          V id: 1
                             li: 3.0
                                                                                                tail of i: 7.0
                                                                                                                        gama_i0: 0.0
                                                                                                                                                    gama_i1: 4.0
                                                      demand i: 140.0
                    duration time i: 4.0
                                                                                    work load i: 140.0
                                                                                                                    work load gap_i: 0
244 Algorithm finished and the total CPU time: 547 s
245 End
```