```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=53920
2
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_4 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
24
       Iter_num_GA = 300
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:
36
     obj[0] = 13.65 temp_best_value_gen = 13.65
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 13.65 temp_best_value_gen = 7.80
     Yes, update solution and obj[gen] = 7.80
41
     solution chromosome =
42
43
       first level: [ [2.5 6.5]
       second level: [1, 1,]
44
       third level: [2. 2.]]
45
46
     The No. 1 iteration is finished!
47
   Beging the No. 2 iteration:
obj[gen-1] = 7.80 temp_best_value_gen = 7.80
48
49
50
     No, maintain solution and obj[gen] = 7.80, and the tolerance_counter = 1
51
     solution chromosome =
52
       first level: [ [2.5 6.5]
53
       second level: [1. 1.]
54
       third level: [2. 2.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obj[gen-1] = 7.80 temp best value gen = 5.80
59
     Yes, update solution and obj[gen] = 5.80
60
     solution chromosome =
61
       first level: [ [2.5 6.5]
62
       second level: [0. 1.]
       third level: [3. 2.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 5.80 temp_best_value_gen = 5.80
68
     No, maintain solution and obj[gen] = 5.80, and the tolerance_counter = 1
69
     solution chromosome =
70
       first level: [ [2.5 6.5]
       second level: [0. 1.]
71
       third level: [3. 2.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obj[gen-1] = 5.80 temp_best_value_gen = 5.80
76
     No, maintain solution and obj[gen] = 5.80, and the tolerance counter = 2
77
     solution chromosome =
78
       first level: [ [2.5 6.5]
```

```
second level: [0. 1.]
 81
          third level: [3. 2.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 5.80 temp_best_value_gen = 5.80
No, maintain solution_and_obj[gen] = 5.80, and the tolerance_counter = 3
 85
 86
 87
        solution chromosome =
 88
          first level: [ [2.5 6.5]
 89
          second level: [0. 1.]
 90
          third level: [3. 2.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 5.80 temp_best_value_gen = 5.80
 95
        No, maintain solution and obj[gen] = 5.80, and the tolerance_counter = 4
 96
        solution chromosome =
 97
          first level: [ [2.5 6.5]
 98
          second level: [0. 1.]
 99
          third level: [3. 2.]
100
        The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
        obj[gen-1] = 5.80 temp best value gen = 5.80
103
104
        No, maintain solution and obj[gen] = 5.80, and the tolerance_counter = 5
105
        solution chromosome =
          first level: [ [2.5 6.5]
106
          second level: [0. 1.]
107
108
          third level: [3. 2.]]
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 5.80 temp_best_value_gen = 5.80
113
        No, maintain solution and obj[gen] = 5.80, and the tolerance_counter = 6
        solution chromosome =
114
115
          first level: [ [2.5 6.5]
116
          second level: [0. 1.]
117
          third level: [3. 2.]]
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 5.80 temp_best_value_gen = 5.80
        No, maintain solution and obj[gen] = 5.80, and the tolerance_counter = 7
122
123
        solution chromosome =
124
          first level: [ [2.5 6.5]
125
          second level: [0. 1.]
126
          third level: [3. 2.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 5.80 temp_best_value_gen = 5.80
131
        No, maintain solution and obj[gen] = 5.80, and the tolerance_counter = 8
132
        solution chromosome =
133
          first level: [ [2.5 6.5]
134
          second level: [0. 1.]
135
          third level: [3. 2.]]
136
        The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
        obj[gen-1] = 5.80 temp_best_value_gen = 5.80
140
        No, maintain solution and obj[gen] = 5.80, and the tolerance_counter = 9
141
        solution chromosome =
142
          first level: [[2.5 6.5]
          second level: [0. 1.]
143
          third level: [3. 2.]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 5.80 temp_best_value_gen = 3.80
        Yes, update solution and obj[gen] = 3.80
149
150
        solution chromosome =
151
          first level: [ [2.5 6.5]
152
          second level: [0. 0.]
153
          third level: [3. 3.]]
154
        The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
        obj[gen-1] = 3.80 temp_best_value_gen = 3.80
158
        No, maintain solution and obj[gen] = 3.80, and the tolerance_counter = 1
159
        solution chromosome =
160
          first level: [ [2.5 6.5]
          second level: [0, 0,]
161
162
          third level: [3. 3.]]
163
        The No. 14 iteration is finished!
```

```
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 3.80 temp_best_value_gen = 3.80
166
167
       No, maintain solution and obj[gen] = 3.80, and the tolerance_counter = 2
168
        solution chromosome =
169
          first level: [ [2.5 6.5]
170
          second level: [0. 0.]
171
          third level: [3. 3.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
       obj[gen-1] = 3.80 temp_best_value_gen = 3.80
       No, maintain solution and obj[gen] = 3.80, and the tolerance counter = 3
176
177
       solution chromosome =
178
          first level: [ [2.5 6.5]
179
          second level: [0. 0.]
180
          third level: [3. 3.]]
181
        The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
184
       obj[gen-1] = 3.80 temp_best_value_gen = 3.80
185
       No, maintain solution and obj[gen] = 3.80, and the tolerance_counter = 4
186
        solution chromosome =
187
          first level: [ [2.5 6.5]
          second level: [0. 0.]
188
          third level: [3. 3.]
189
190
       The No. 17 iteration is finished!
191
192 Beging the No. 18 iteration:
193
       obj[gen-1] = 3.80 temp_best_value_gen = 3.80
194
       No, maintain solution and obj[gen] = 3.80, and the tolerance counter = 5
195
       solution chromosome =
196
          first level: [ [2.5 6.5]
197
          second level: [0. 0.]
198
          third level: [3. 3.]]
199
       The No. 18 iteration is finished!
200
201 Beging the No. 19 iteration:
202
       obj[gen-1] = 3.80 temp_best_value_gen = 3.80
203
       No, maintain solution and obj[gen] = 3.80, and the tolerance_counter = 6
204
       solution chromosome =
205
          first level: [ [2.5 6.5]
          second level: [0. 0.]
206
207
          third level: [3. 3.]]
208
        The No. 19 iteration is finished!
209
210 Beging the No. 20 iteration:
211
       obj[gen-1] = 3.80 temp_best_value_gen = 3.80
212
       No, maintain solution and obj[gen] = 3.80, and the tolerance_counter = 7
213
       solution chromosome =
          first level: [ [2.5 6.5]
214
215
          second level: [0. 0.]
216
          third level: [3. 3.]]
217
       The No. 20 iteration is finished!
218
219 Beging the No. 21 iteration:
       obj[gen-1] = 3.80 temp_best_value_gen = 3.80
220
221
       No, maintain solution and obj[gen] = 3.80, and the tolerance_counter = 8
222
       solution chromosome
223
          first level: [[2.5 6.5]
224
          second level: [0. 0.]
225
          third level: [3. 3.]]
226
       The No. 21 iteration is finished!
227
228 Beging the No. 22 iteration:
229
       obj[gen-1] = 3.80 temp_best_value_gen = 3.80
230
       No, maintain solution and obj[gen] = 3.80, and the tolerance_counter = 9
       solution chromosome =
231
232
          first level: [ [2.5 6.5]
233
          second level: [0. 0.]
234
          third level: [3.3.]
235
       The No. 22 iteration is finished!
236
237 Beging the No. 23 iteration:
238
        obj[gen-1] = 3.80 temp_best_value_gen = 3.80
239
       No, maintain solution and obj[gen] = 3.80, and the tolerance_counter = 10
240
       solution chromosome =
241
          first level: [ [2.5 6.5]
242
          second level: [0. 0.]
243
          third level: [3. 3.]]
244
       The No. 23 iteration is finished!
245
246
247
```

```
unknown
248 The iteration is terminated and then visulize the solution:
249
250
251
         solution chromosome =
            first level: [ [2.5 6.5] second level: [0. 0.]
252
253
254
255
            third level: [3.3.]
         Objective function values and some other indicators:

Obj0 = 2.00 Obj1 = 0.00 Obj0
                                                             Obj0 + Obj1 = 2.00
            Total movement of crane: 0.00
256
257
            Total waiting time in berth position: 0.00
            Total index of q during berthing: 43.00
258
         Specific arrangement for each vessel:
259
                                                                                                                                       gama_i0: 0.0
            V\_id{:}\ 0
                                 li: 5.0
                                                        xi: 2.5
                                                                             bow of i: 0.0
                                                                                                           tail of i: 5.0
                                                                                                                                                                     gama_i1: 3.0
                       duration_time_i: 3.0
                                                             demand_i: 160.0
                                                                                              work load i: 160.0
                                                                                                                                 work load gap_i: 0
260
            V_id: 1
                                 li: 3.0
                                                                             bow of i: 5.0
                                                                                                           tail of i: 8.0
                                                                                                                                       gama_i0: 0.0
                                                        xi: 6.5
                                                                                                                                                                     gama_i1: 2.0
                       duration\_time\_i{:}~2.0
                                                             demand_i: 120.0
                                                                                              work load_i: 120.0
                                                                                                                                  work load gap_i: 0
261
262 Algo
263 End
      Algorithm finished and the total CPU time: 596\ s
264
```